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BIENNIAL REPORT

OF THE

Board of State Harbor Commissioners

FOR THE TWO FISCAL YEARS

COMMENCING JULY 1, 1896, AND ENDING JUNE 30, 1898.

SACRAMENTO:
A. J. JOHNSTON, : : : : : : : SUPERINTENDENT STATE PRINTING.
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BIENNIAL REPORT

OF THE

BOARD OF STATE HARBOR COMMISSIONERS.

SAN FRANCISCO, July 1, 1898.

HON. JAMES H. BUDD, *Governor of California, Sacramento, Cal.:*

SIR: Pursuant to the provisions of Section 2537 of the Political Code, the Board of State Harbor Commissioners in charge of the water-front, in the City and County of San Francisco, herewith respectfully submit the following report for the two (2) fiscal years commencing July 1, 1896, and ending June 30, 1898, embracing a complete statement of all moneys received and disbursements made—from what source received, and for what purpose expended. These and other statements appear in tabulated form under the following exhibits:

Exhibit A—Summary of receipts and disbursements during the last two (2) fiscal years; showing also amounts remitted to State Treasurer.

Exhibit B—Statement showing the condition of the San Francisco Harbor Improvement Fund, June 30, 1898.

Exhibit C—Statement showing the condition of the San Francisco Depot Sinking Fund, June 30, 1898 (per books of State Treasurer).

Exhibit D—Statement showing the condition of the San Francisco Depot Fund, June 30, 1898.

Exhibit E—Comparative statement of receipts and disbursements from the organization of the Commission on November 4, 1863, up to June 30, 1898.

Exhibit F—Statement of receipts and disbursements for the two (2) fiscal years ending June 30, 1898; showing whence the revenue was derived and the purposes for which expended.

Exhibit G—Itemized statement of Harbor Improvement Fund, for the two (2) fiscal years ending June 30, 1898; showing monthly remittances to the State Treasurer and payments made by drafts on State Controller.

Exhibit H—San Francisco Depot Fund, with itemized statement of disbursements made.

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Exhibit I—San Francisco Depot Sinking Fund, showing total amount transferred thereto from San Francisco Harbor Improvement Fund, under an Act of the Legislature approved March 17, 1891.

Exhibit J—Balance sheet from the organization of the Commission, November 4, 1863, to June 30, 1898.

Exhibit K—Construction Account No. 1, showing contracts under way at the date of last Biennial Report, and since completed.

Exhibit L—Construction Account No. 2, showing work contracted for and completed within the last two (2) fiscal years.

Exhibit M—Construction Account No. 3, showing work contracted for within the last two (2) fiscal years, but not yet completed.

Exhibit N—Construction Account No. 4, Seawall constructed from 1878 to 1893, showing cost of same.

Exhibit O—Construction Account No. 5, Belt Railroad, its cost and maintenance, and revenue derived therefrom.

Exhibit P—Construction Account No. 6, Union Depot and Ferry House.

Exhibit Q—Statement of cost of dredging by years, since June 30, 1875.

Exhibit R—Statement of foreign and domestic tonnage entering the Golden Gate, by years, since 1864.

Exhibit S—Report of J. B. Harries, Expert Accountant.

Exhibit T—Report of Howard C. Holmes, Chief Engineer of the Board.

Exhibit U—Report of Tirey L. Ford, Attorney of the Board.

Exhibit V—Report of Edward R. Swain, Architect Union Depot and Ferry House.

Section 2524 of the Political Code contains a full description of the waterfront under the control of this Board acting as agents for the State. Briefly outlined, it commences on the north where the easterly line of the Presidio Reservation intersects the waterfront line as established by the Board of State Tide Land Commissioners, and extends to the southern boundary line of the City and County of San Francisco. The distance between these two points, measured along the waterfront, is about 53,000 feet, or a little over ten miles. This frontage will afford ample room for the construction of 240 piers 600 feet long to accommodate at one time 960 ships. Allowing each vessel one month to discharge, load, and repair, the number of wharves could accommodate 11,520 ships in a year, which would represent a tonnage greatly in excess of that of either London or Liverpool.

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Chief Engineer Arnold, in a report to the Board in 1873, referring to this harbor, said:

"The area of the Bay of San Francisco, exclusive of the basins known as San Pablo and Suisun bays, reckoned to the line of high water, is two hundred and fifty-seven (257) square miles, of which seventy-nine (79) square miles are within the three-fathom contour line and navigable for large sea-going vessels. The anchorage basin proper, within the boundaries of the City and County of San Francisco and immediately adjacent thereto, embraces an area of fifty-nine (59) square miles, and notwithstanding its great extent, ships riding at anchor in its most exposed localities are seldom damaged by the most violent gales that prevail in the winter months.

"The entrance to the harbor between Fort Point and Lime Point is nine tenths of a mile in width, and the depth of the bar is thirty-three feet at low tide. The earliest charts of the harbor show about the same depth of water, which seems to indicate that no appreciable portion of the vast amount of sediment which is being constantly discharged into the bay effects a lodgment upon the bar.

"This was to be expected, since all the streams of any magnitude which flow into the bay enter it through broad and deep basins, where the river currents slacken and the suspended matter is deposited. Compared with San Francisco Bay, the harbor of New York seems insignificant. New York Bay at high tide covers an area of twenty-two square miles, of which but nine and one half square miles are within the three-fathom line. Add to this the deep water in the North and East rivers, adjacent to the city, and there is a total available area of twenty-one and one half square miles. The entrance at the Narrows is three fourths of a mile in width, very nearly as wide as the Golden Gate, but the depth on the bar does not exceed twenty-two feet at low water."

From this accurate outline of the harbor of San Francisco it becomes apparent that nature has been indeed generous to this Western metropolis.

The commercial future of San Francisco cannot be overestimated. The increase in trade that will surely follow the completion of the Nicaragua Canal, and the greatly enlarged traffic with Central America and the islands of the Pacific that now seems almost assured, will in the near future advance this port many points on the list of the great commercial marts of the world's commerce.

WHARVES AND BULKHEADS.

Belonging to the State, and at present operated by this Board for commercial traffic by water, are 31 wharves, 10 ferry slips, and about 3 miles of bulkheads.

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The material used in the construction of the same consists of piles and lumber.

The approximate number of piles in place on the waterfront is 62,254.

The estimated quantity of lumber now in the wharves and bulkheads is 21,092,227 feet (board measure).

Passing over these wharves and bulkheads, daily, are heavy trucks, carts, wagons, etc., laden with merchandise, to and from vessels lying alongside of wharves in the harbor. The weight of merchandise passing over the State property described will aggregate about 9,000 tons daily.

In addition to this immense traffic, the wharves and bulkheads are also used by pedestrians and the traveling public. The bulkheads are open thoroughfares for the public day and night.

Some idea of the extent of the wear and tear on these plank roadways can therefore be readily formed. To keep the same in good condition at all times is a matter of the first importance to the shipping interests, as well as to the people generally who have more or less business on the waterfront.

The Board has, therefore, kept constantly employed a large number of men on the repair force, and we are pleased to say that the wharves and bulkheads under the Board's jurisdiction are, at the present time, in first-class condition.

PRESERVATION OF PILES AND TIMBER.

The most important subject affecting our wharves is the rapid destruction of piles forming the support of the piers and bulkheads over the waters of the bay. This rapid destruction is caused by the ravages of the marine pests known as the *Teredo navalis* and the *Limnoria terebrans*.

Piles driven in this harbor without treatment to repel the attacks of the marine worms become comparatively unsafe to sustain much weight in from two to four years.

The teredo and limnoria work out their instinctive system of pile destruction by different methods.

The teredo enters the pile between the mud line and the low-water mark, and makes its way across the grain of the wood and into the heart of the pile. It then bores with the grain upward as far as high-water mark, and downward to the line of the mud. When it enters a pile it is of form almost invisible to the naked eye. It feeds and fattens

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in the pile with the dust of the wood which it obtains by its constant gnawing, and grows to twelve or fifteen inches in length and three quarters of an inch in diameter. It can exist only in sea-water. By removing from the salt water a pile which it inhabits, the teredo will die in from twenty-four to forty-eight hours. Remove the worm from the wood and it dies almost instantly.

The limnoria cuts the pile across the grain from the outside. The portion of the pile on which it operates is just below the line of high water. It virtually cuts the pile in two.

Of the 62,254 piles in place on the waterfront, 52,285 are exposed to the attacks of the teredo and limnoria; the remaining 9,969 being either below the mud line, or are encased in concrete, and therefore free from attack.

The approximate cost of these 52,285 piles and placing them in position, at present prices, would be about $637,877. Renewing these piles every four years, on the same basis as to expense, during a period of twenty years would reach the enormous sum of $3,189,385. It would even exceed this figure, for the reason that when piles are replaced, considerable tearing up of wharf superstructure becomes necessary, and the labor incident thereto would add greatly to the sum stated.

To protect piles from the ravages of the teredo and limnoria, many methods have been patented, both in this country and in Europe. The teredo attacks wood exposed to salt water apparently in all climes, although in some places it only operates during the summer months, while in San Francisco it continues its work of destruction in both summer and winter.

The limnoria is not known to exist in all waters as general as the teredo, but in our bay it has shown itself ambitious to keep equal pace with the teredo in its destructiveness.

These patents embrace different forms of artificial covering for the piles, while others call for the injection of antiseptics and other chemical matter into the pile itself, which is accomplished after a degree of porousness is formed in the wood by extraction of the sap and moisture therefrom.

It has been demonstrated that it is no economy to drive piles where they will be exposed in the salt water, as they come from the forest, without treating them so as to repel the attacks of the marine worms. It has therefore been the policy of this Board for several years past to apply

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such treatment to the piles used in this harbor that are exposed to attacks by the teredo and limnoria, as observation and tests elsewhere have proved meritorious and economical.

We feel certain that the good policy of this course will exemplify itself in the prolonged life of the piles so treated, and result in a corresponding reduction in repairs to wharves hereafter.

The subject of timber-preserving is a matter also of great importance. It is a well-known fact that timbers exposed to the air and varied climatic changes become subject to dry-rot. Caps and stringers used in wharf construction should always be perfectly sound. In conjunction with the piles, these caps and stringers must sustain the great weight of freight piled upon the different wharves.

The caps compose the heavy timbers (12 x 12's) resting across the top of the piles. The stringers compose the heavy timbers (4 x 12's) resting across the caps, to which the floor timbers of the wharves are fastened.

Experience in the Eastern States and Europe has now made it almost a settled policy, and one of proved economy, to treat timbers by some preserving process.

This Board, in constructing the last two wharves built on the waterfront, viz: Pacific Street Wharf and Folsom Street Wharf No. 1, have experimented in this direction. The timbers used in Pacific Street Wharf were creosoted, and those in Folsom Street Wharf No. 1 were treated under the process called burnettizing.

The preservation of piles and timbers is the one over-shadowing question in the administration of waterfront affairs. In the course of a trial recently, in the Superior Court of San Francisco, involving a consideration of the merits of the various methods of preserving piles, the fact was brought out, upon the testimony of three of the foremost civil engineers on this Coast, that the method of pile treatment adopted by this Board will preserve the piles for from twenty to twenty-five years.

FREE PUBLIC MARKET.

An Act of the Legislature, approved March 29, 1897, authorized this Board to establish and maintain a Free Public Market upon the waterfront, and further authorized the Board to set apart, upon some convenient portion of the waterfront, a sufficient number of docks and piers contiguous to each other for the reception of all perishable products arriving by boat, rail, or other conveyance, including fruit,

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vegetables, eggs, poultry, game, dairy products, and fish, and to permit the sale of such products therein by or for account of producers only, under such regulations as the Board may prescribe.

Considerable attention has been given to this subject-matter with a view to carrying out the mandate of the law. From investigation we approximate the quantity of fruit, vegetables, and perishable products generally arriving in this port annually to be 200,000 tons. This includes arrivals by vessel and rail. The quantity arriving by vessel we approximate 145,000 tons, and by rail 55,000 tons.

The evident intention of the law was to concentrate the fruit, vegetable, and perishable product industry at some point on the waterfront north of Market Street, and to have sales made thereat for account of producers only, with power of regulation vested in the Board.

It is a fact that 83 per cent of the fruit, vegetables, and perishable products have been landed for many years on wharves and bulkheads contiguous to each other, viz: from Jackson Street Wharf on the north to the Ferry Wharf on the south. More than one half of the entire volume of perishable products arriving at this port is now, and has been for years, landed at Jackson Street Wharf; so, therefore, the volume of fruit and perishable products, etc., arriving by the Southern Pacific Company, at Third and Townsend streets, approximating about 35,000 tons annually, constitutes the extent of these products not landed on contiguous territory to Jackson Street.

To arrange for the transfer of these products now landed by the Southern Pacific Company at Third and Townsend streets, to a point on the waterfront north of the Ferry Depot, is a matter fraught with many difficulties, chief among which is that the Belt Railroad system does not extend to Third and Townsend streets.

The Board, after having given the question of the Free Market earnest consideration, and while it realizes the difficulties surrounding the practical execution of the project, have determined, and will at an early day declare by a resolution, that all wharves and bulkheads at which fruit, perishable products, etc., are now landed, shall constitute a Free Public Market.

The Board is also considering the subject of rules and regulations governing the sales of such products on such wharves and bulkheads, and will appoint a superintendent to take charge of the Market.

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NEW FERRY DEPOT.

The new Union Depot and Ferry House, at the foot of Market Street, is completed, and will be opened to the public July 11, 1898.

That the necessities of the port were such as to require a stately passenger depot at the gateway to the "Metropolis of the Pacific" is a fact universally conceded. The building just completed, in point of architecture, workmanship, and general grandeur, compares favorably with any structure dedicated to similar use, either in this country or Europe.

Through its magnificent corridors, arcades, and waiting-rooms will pass the tourist from abroad, with whom first impressions are the most lasting, and from the splendor surrounding the entrance leading him within the portals of the "City by the Golden Gate," will he judge of the enterprise and progressiveness of our people, and will, therefore, inspire him to investigate the resources of our great commonwealth.

The dimensions of this building are: Length, 659 feet; width, 156 feet; height from top of foundation to top of parapet wall is 54 feet.

The size of tower is 32 feet square, and the height from foundation to the time-ball on top is 245 feet.

To the top of the flagstaff ball is 275 feet, which is the extreme height.

As described by Chief Engineer Holmes, in his report to the Board September 12, 1896:

"The foundation of the approaches to the Ferry Slips Nos. 2, 3, 4, 5, and 6, which will also serve as foundations for the new Union Depot and Ferry House, was completed September 1, 1895. The same consists of 111 concrete piers of the dimensions of 16 by 28 feet at the base, and of 8 feet 6 inches by 28 feet at the top, with depth of 20 feet below city base, and also portion of the concrete seawall in front of Sections 8a and 8b. These are joined together by a series of groined concrete arches (2 feet in thickness at soffit) into one immense area of floor space 160 feet in width by 670 feet in length. This enormous foundation rests upon a sub-foundation of grillage supported by over 5,000 piles, each not less than 80 feet in length. 28,000 cubic yards of concrete with 36,000 barrels of cement were required in the construction of the arches and floors. Assuming the weight of concrete to be 4,000 pounds per cubic yard, the total weight of this structure would be 112,000,000 pounds, or 56,000 net tons."

On this foundation rests the superstructure for the construction of which the State has issued bonds in the sum of $600,000, payable in nineteen years from date of issuance. The sum of $4,631 is transferred monthly from the San Francisco Harbor Improvement Fund to the San

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Francisco Depot Sinking Fund, and with the moneys so transferred principal and interest will be fully paid off in nineteen years from the date of the issuance of the bonds.

On the sale of these bonds a premium of $7,125 was obtained, which makes the amount to start with, in the San Francisco Depot Fund, $607,125.

Exhibit H of this report contains an itemized account of the expenditures against this fund.

It will be observed from said exhibit, plus additions and minus deductions from original contracts, that the percentage for extra work amounts to only 5.15 per cent.

The lower floor of the Union Depot and Ferry House will be occupied as follows: South wing—Ticket offices, baggage offices, and waiting-rooms of the Southern Pacific Company, and news stand. North wing—Post Office, Wells Fargo & Co., and ticket office, baggage offices, and waiting-rooms of the San Francisco & North Pacific Railroad, and North Pacific Coast Railroad, and news stands in the different waiting-rooms, and Chief Wharfinger's office.

The second floor will be occupied as follows: South wing—Offices of the Harbor Commission, ticket offices and waiting-rooms of the Southern Pacific Company, and news stand. North wing—Business department of the Post Office, Superintendent of the Building; Harbor Pilots Association, and ticket offices and waiting-rooms of the San Francisco & North Pacific Railroad, and the North Pacific Coast Railroad.

There are three offices on the second floor for which no arrangements have been yet made as to occupancy.

Mezzanine floor (third story) will be occupied by the State Board of Trade and the State Mining Bureau, where exhibits of the agricultural and mining industries of the State will be daily open to the public.

Connected with the second story of the building are passenger bridges leading to the upper decks of the different steamers landing at the ferry slips at the foot of Market Street. Attached to these bridges are drop-aprons worked by hydraulic power, which connect with the steamers, and give the passengers who travel on the upper deck of a vessel an opportunity of going direct from the second story of the Ferry Depot to the passenger cabin, and vice versa, in landing on the San Francisco side of the bay, without having to pass on the lower deck, as has been the case heretofore. This change is of great convenience to the lady passengers particularly.

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In the second story of the building is a grand central nave or hallway, 659 feet long and 45 feet wide, with mosaic floor, and the sides of the walls lined with Tennessee marble to a height of 12 feet 3 inches.

DREDGING.

There is more or less shoaling in the channels between and alongside the wharves.

A depth of water at different piers and approaches thereto must be maintained at all times for vessels of the deepest draught. This necessitates the constant operation of a dredging plant consisting of two dredgers, four mud scows, and two tow-boats. Both of the latter are fully equipped with all the modern appliances to perform fire duty.

During the last two fiscal years, 1,337,200 cubic yards have been dredged out, at a cost of $109,965.12, which includes salaries of employés, repairs, coal, and all other expenses of maintaining the dredger plant. The average cost of dredging during the last two years has, therefore, only been 8.23 cents per cubic yard.

Exhibit Q contains a full statement of the cost of this service for the last twenty-four years, during which time the State has operated its own plant. The average cost per year for dredging during this period has been 9.01 cents per cubic yard. When dredging was done by contract, the cost varied from 36 cents to 50 cents per cubic yard.

BELT RAILROAD.

Exhibit O contains a full financial statement in connection with the construction and operation of the Belt Railroad.

The Board of State Harbor Commissioners were authorized to construct such a railroad by Act of the Legislature approved March 19, 1889.

This department, under the jurisdiction of the Board, now performs a very important and valuable service to the commercial community, and will doubtless become in the future more general in its operation. This railroad is about one mile in length, extending from Vallejo Street to Powell Street. Three rails are used, thus making it serviceable for standard and narrow gauge cars.

The railroad companies availing themselves of the service of the Belt Line are the San Francisco & North Pacific, the North Pacific Coast, and the branch of the Southern Pacific Company, formerly known as the South Pacific Coast Railroad. Of late, cars of the Western Division

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of the Central Pacific (S. P. Co. system) have been operated on the Belt Line.

The Board has built for these several companies freight depots on waterfront property, alongside of which, cars are switched to unload and receive freight.

Cars are transported on steamers operated by the companies themselves. These steamers land at ferry slips adjoining Lombard Street Wharf. From these steamers the Belt Railroad moves the cars and places them at proper destination on the waterfront, and, vice versa, moves cars back again aboard said steamers.

During the seven years' operation of the Belt Railroad, 98,902 cars have been switched on the principle above set forth.

The extension of the Belt Line along the waterfront south of its present terminus is a matter beset with many difficulties. From Pacific Street on the north to Folsom Street on the south, the State is not in possession of any property that could be used for yard purposes, which is a very necessary adjunct for the proper operation of a railroad of this kind.

There is an immense traffic at the foot of Market Street. Extending the Belt Railroad south, it would be necessary to cross this point, and in this another difficulty presents itself. The seawall is now extended to a point between Market and Mission streets. A further extension to Folsom Street would not give the State any property in waterfront lots on the thoroughfare. When the seawall, however, is extended from Folsom Street south, then much useful property on the south end will come into the possession of the State, and the same can be utilized to advantage.

SAN FRANCISCO DEPOT SINKING FUND.

Commencing January 1, 1893, there has been transferred from the San Francisco Harbor Improvement Fund to the San Francisco Depot Sinking Fund, the sum of $4,631 monthly.

Such monthly transfers, in a period of nineteen years, will aggregate a sum sufficient to pay principal, and interest at 4 per cent per annum, on the $600,000 for which bonds were issued.

The bonds, however, were not sold or delivered until July 12, 1894. Therefore, no interest has been or will be paid on any bonds from January 1, 1893, to July 1, 1894, a period of eighteen (18) months, although the amount transferred to the Depot Sinking Fund during that period includes interest money amounting to $36,000.

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We would therefore recommend the passage of a bill by the Legislature authorizing the transfer of $36,000 from the San Francisco Depot Sinking Fund to the San Francisco Harbor Improvement Fund.

COMPLETION OF THE SEAWALL.

The bill passed by the last Legislature, providing for an issue of $1,000,000 in bonds for the completion of the seawall from its present southerly terminus between the foot of Market Street and the foot of Mission Street, and which the Governor, owing to some material fault in the drafting of the measure, declined to sanction, should be readopted by the next Legislature. Nothing is so much needed on the waterfront to place it in a condition permanently to meet the requirements of commerce as the completion of the seawall. For reasons which were set forth in full by our Chief Engineer to the committee of the last Legislature, and which are familiar to every one connected with the maintenance of the vast area of wooden structures from Mission Street to the Mail Dock, it would be a matter of great economy and in accordance with ordinary business sagacity to anticipate the revenues and build the wall at once. The saving in repairs, not to speak of the reclamation of valuable seawall lots, would, in the twenty years covered by the life of the bonds, be more than sufficient to meet the interest and sinking fund demands and leave a handsome surplus. The seawall would thus be obtained without, in reality, the expenditure of a single dollar; whereas, if it is not built in this way, twenty years from now will not, in all probability, see it built for more than a fraction of the distance proposed.

In this connection it is worth while to observe that the proposed bonds would not fall as a burden upon the taxpayers of the State, as a popular error, finding expression occasionally in the newspapers, assumes that the depot bonds fall. These latter, as well as the proposed seawall bonds, would be met, principal and interest, by the ordinary revenues of the Harbor Commission. These revenues are derived from rents, dockage upon vessels, and tolls upon cargoes. It might be said that, as a tax levied upon commodities is paid by the last consumer, these taxes are, after all, State taxes, resting in the final analysis upon citizens in remote sections as well as near by. But this can be true only of the comparatively small percentage of products sent out of this State by producers or brought in for consumption here. There is no tax at all upon cereal products, while the great bulk of other things, being produced outside of this State, and designed for consumption outside of this

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State, as for example cargoes from the Orient en route to the East, pays tolls only as it passes by. It is with money thus derived that the Ferry Building and all other improvements on the waterfront have been constructed, and not, as the popular error referred to has it, with taxes levied in an indirect way upon the people of the State.

FIRE AT FOLSOM STREET WHARF.

About 3 P. M. on June 29, 1897, a fire occurred on the new Folsom Street Wharf which had just been completed. The superstructure of the wharf was mostly destroyed. The cause of the fire is unknown.

Contracts were immediately awarded for the re-construction of same, amounting to $19,833.27.

This is the first loss by fire in the history of the waterfront.

EXPERTING ACCOUNTS.

Exhibit S is a report of J. B. Harries, Expert Accountant.

In this connection we desire to say that the books and accounts of the Commission are experted quarterly.

REPORT OF CHIEF ENGINEER.

Special attention is directed to the report of Howard C. Holmes, Chief Engineer of the Board, which is embraced in Exhibit T.

During the months of September and October, 1897, by direction of the Board, he visited the ports of New York, Boston, and Philadelphia, and examined into the system of wharf building and harbor improvements generally at the places named.

The Chief Engineer, with careful detail, reports the results of his investigations while East, and the information obtained and set forth in his report will be found useful to this and future Boards.

REPORTS OF ATTORNEY AND ARCHITECT.

Subjoined hereto, under the head of Exhibits U and V, will be found the reports of Tirey L. Ford, Attorney of the Board, and Edward R. Swain, Architect of the Union Depot and Ferry House.

Very respectfully,

E. L. COLNON,
P. J. HARNEY,
RUDOLPH HEROLD, JR.,
Commissioners.

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EXHIBIT A.

SUMMARY OF RECEIPTS AND DISBURSEMENTS.

RECEIPTS.				DISBURSEMENTS.			
	1896-97.	1897-98.	Total.		1896-97.	1897-98.	Total.
From dockage	$161,584 40	$166,889 50	$328,473 90	Salaries of Commissioners, Secretaries, Engineers, Draughtsman, Attorney, Wharfingers, Collectors, Watchmen, and Clerks in Secretary's office	$86,933 70	$89,973 80	$176,907 50
From tolls	182,860 93	194,718 10	377,579 03				
From wharfage	3,331 25	4,041 64	7,372 89				
From rents of wharves, seawall lots, special dock privileges, including reserving of berths, ferry slips, Belt Railroad freight sheds and offices	197,060 82	195,977 85	393,038 67	Construction, including building of new wharves, slips, sheds, sewers, and roadways, maintenance and repairs of waterfront streets, old wharves, buildings, ferry depot foundation, roadway, and seawall	319,085 55	313,603 11	632,688 66
From sale of old material (urgent repairs)	566 85	1,657 75	2,224 60				
From Fisherman's Wharf, exclusive of rents	3,828 25	3,436 25	7,264 50				
From miscellaneous, damage to property, etc.	1,231 55	1,191 96	2,423 51	Wharf cleaning	28,809 18	34,872 20	63,681 38
From Belt Railroad, switching	11,619 25	13,313 50	24,932 75	Dredging	55,686 31	54,278 81	109,965 12
From sale of old material (Dredgers Nos. 1 and 2)	39 75	----------	39 75	Seawall account	6,658 01	----------	6,658 01
Duplication payroll, Dredger No. 1	----------	374 50	374 50	General expenses, including office rent, fuel, stationery, printing, legal expenses, lighting wharves, overpaid revenue returned, and other incidental expenses	18,305 69	28,724 56	47,030 25
Duplication payroll, Sweepers	----------	60 00	60 00				
Total receipts	$562,123 05	$581,661 05	$1,143,784 10	Belt Railroad construction and maintenance	11,422 57	18,458 63	29,881 20
Amount drawn from S. F. Harbor Improvement Fund	226,419 29	189,813 94	416,233 23	Fire account	5,029 12	6,861 23	11,890 35
				Total disbursements	$531,930 13	$546,772 34	$1,078,702 47
				Amount remitted to State Treasurer	256,612 21	224,702 65	481,314 86
	$788,542 34	$771,474 99	$1,560,017 33		$788,542 34	$771,474 99	$1,560,017 33

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During the last two fiscal years there was collected the sum of $1,143,784.10, and expended $1,078,702.47, exclusive of the money transferred by the Controller from the San Francisco Harbor Improvement Fund to the San Francisco Depot Sinking Fund. The money thus transferred to the Depot Sinking Fund by authority of an Act approved March 17, 1891, during the last two fiscal years, amounts to $111,144, which would bring the total expenditures to $1,189,846.47.

EXHIBIT B.

The following shows the condition of the San Francisco Harbor Improvement Fund June 80, 1898:

Amount in fund July 1, 1896	$82,444 93	
Amount remitted to June 30, 1898	481,314 86	
		$563,759 79
Amount drawn out to June 30, 1898 (ordinary expenditures)	$416,233 23	
Amount transferred to San Francisco Depot Sinking Fund	111,144 00	
Amount in fund July 1, 1898	36,382 56	
		563,759 79

EXHIBIT C.

The following shows the condition of the San Francisco Depot Sinking Fund June 30, 1898 (per books of State Treasurer):

Total amount transferred from the San Francisco Harbor Improvement Fund to the San Francisco Depot Sinking Fund	$301,015 00	
Interest on United States Bonds purchased	16,000 00	
		$317,015 00
United States Bonds purchased	$170,000 00	
Premiums paid on same	29,887 50	
Expenses entailed in purchase	463 20	
Interest accrued on same	138 65	
Interest paid on $600,000 San Francisco Depot Bonds	84,000 00	
Cash on hand in State Treasury	32,525 65	
		317,015 00

EXHIBIT D.

The following shows the condition of the San Francisco Depot Fund June 30, 1898:

Total amount of fund	$607,125 00
Amount drawn out to June 30, 1898	586,298 23
Amount in fund July 1, 1898	$20,826 77

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EXHIBIT E.

COMPARATIVE STATEMENT OF RECEIPTS AND DISBURSEMENTS—1863-1898.

Fiscal Year.	Receipts.	Expenses.	Percentage per Year.	Construction and Repairs.	Seawall	Dredging.	Purchase of Dredgers, Scows, and Repairs	Constructing and Operating Belt Railroad	Miscellaneous	Remitted State Treasurer	Drawn from State Treasurer
From the Organization of the Commission	From Dockage, Tolls, Wharfage, Rents, etc.	Salaries (Commissioners, Secretaries, Clerks, Wharfingers, Collectors) Law Fees, Fuel, Rent, Printing, Stationery, etc.		Building Sheds, Wharves, Bulkheads, etc., Ferry Foundation and Repairs on Same		All Dredging up to 1874 was done under Contract, Since by Commissioners					
1863-64	$117,848 28	$25,354 84	21.50	$67,599 82					$976 25	$71,897 39	$47,680 02
1864-65	177,393 66	32,439 10	18.28	80,875 15						123,365 23	62,334 82
1865-66	183,716 80	35,531 42	19.02	19,065 42	$3,607 00	$44,106 50				132,023 96	47,568 50
1866-67	336,409 36	41,233 95	11.95	88,525 78	266 50	10,300 00			330 62	268,573 45	64,345 94
1867-68	294,304 28	55,531 92	18.87	82,791 27	250,991 97	41,021 00			561 18	217,528 06	354,121 12
1868-69	287,890 53	52,130 77	18.11	38,779 83	262,323 13	32,338 00				212,532 07	310,213 27
1869-70	252,649 56	54,684 40	21.65	35,545 04	165,892 68	80,100 00				180,623 37	272,670 93
1870-71	148,917 03	37,782 65	25.37	53,693 31		35,258 00				96,097 20	73,914 13
1871-72	195,031 14	61,006 70	31.28	28,146 62		53,944 40				105,877 82	53,944 40
1872-73	190,330 47	69,858 63	36.50	78,776 28		32,293 20				91,042 59	80,640 23
1873-74	265,709 06	77,938 05	29.33	104,175 98	2,321 85	42,478 56	$34,070 00		6,344 01	166,150 23	168,769 62
1874-75	373,541 72	68,617 14	18.37	209,540 80	1,078 25	33,835 71	3,725 00		924 99	245,369 00	189,549 17
1875-76	372,078 74	65,976 57	17.73	162,000 25		40,802 70			565 47	249,450 44	146,716 69
1876-77	448,087 25	79,208 85	17.68	284,023 05		25,252 94	15,354 45			310,909 33	266,661 37
1877-78	446,516 82	84,326 72	18.88	112,628 95	4,803 38	38,214 40	82,068 79		1,665 88	285,521 50	162,712 80
1878-79	466,420 55	97,162 63	20.83	164,560 55	107,091 87	60,454 68	3,948 84		595 50	274,370 87	241,764 39
1879-80	427,687 56	100.667 57	23.53	141,022 14	309,652 90	51,675 28	1,173 50		2,510 53	240,414 91	419,429 27
1880-81	419,437 49	102,746 75	24.49	199,972 97	383,174 96	51,462 52			4,785 32	204,782 41	527,487 44
1881-82	355,005 64	104,255 15	22.91	86,102 58	92,804 98	48,743 45			4,320 00	249,919 90	131,140 42
1882-83	436,030 54	107,883 69	24.74	179,089 82	34,949 22	51,457 50	5,247 00		28,129 37	194,860 84	165,586 90

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1883–84	501,243 25	115,231 30	22.98	173,997 19	76,461 63	60,780 40	.....	.....	6,863 55	254,497 78	186,588 60
1884–85	500,702 10	116,194 14	23.20	248,607 11	195,706 95	52,258 80	.....	.....	4,933 50	259,702 01	376,700 41
1885–86	483,851 04	117,693 22	24.32	197,612 03	157,953 82	46,675 40	.....	.....	4,324 00	249,431 18	289,838 61
1886–87	527,890 96	128,584 90	24.35	153,529 29	53,403 50	78,046 99	.....	.....	5,742 95	245,509 83	136,926 50
1887–88	580,152 51	138,993 05	23.95	294,855 61	36,360 98	54,082 70	.....	.....	5,450 62	294,861 66	244,452 11
1888–89	619,537 54	139,552 66	20.91	231,353 84	101,586 24	62,424 96	.....	.....	10,152 33	321,605 12	247,137 61
1889–90	599,105 58	131,262 56	21.91	301,063 18	115,419 48	51,588 91	.....	.....	5,257 21	306,148 20	311,633 96
1890–91	600,821 20	115,579 39	19.23	269,542 63	65,810 20	53,230 81	.....	$327 61	9,600 62	319,721 19	232,991 25
1891–92	651,112 11	114,860 89	17.64	275,083 97	122,112 90	56,081 70	.....	81,307 46	7,663 95	360,206 68	366,205 44
1892–93	629,957 55	121,882 55	19.34	319,991 36	72,025 44	54,871 48	35,384 00	15,933 10	5,771 81	334,575 70	320,477 89
1893–94	583,674 58	123,039 43	21.08	338,570 00	23,158 22	58,357 87	.....	14,643 63	4,815 50	281,417 59	260,327 66
1894–95	586,618 61	137,684 55	23.47	444,366 85	55 00	48,132 14	31,532 29	30,755 26	4,827 05	215,278 73	326,013 26
1895–96	599,207 89	135,267 13	22.57	390,935 35	.....	50,295 44	6,343 58	15,189 01	6,582 96	285,523 58	290,929 16
1896–97	562,123 05	133,138 80	23.68	319,085 55	6,658 01	55,686 31	.....	11,422 37	5,938 89	256,612 21	226,419 29
1897–98	581,661 05	151,598 53	26.06	313,603 11	.....	54,278 81	.....	18,458 63	8,833 26	224,702 65	189,813 94
	$14,902,665 50	$3,274,900 60	.....	$6,489,112 68	$2,645,671 06	$1,610,531 56	$208,847 45	$188,037 27	$148,167 32	$8,131,104 68	$7,793,707 12

Balance in San Francisco Depot Sinking Fund, June 30, 1896	189,871 00
Amount transferred to San Francisco Depot Sinking Fund, fiscal years 1896–97 and 1897–98	111,144 00
Balance in Treasury June 30, 1898	36,382 56
	$8,131,104 68

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EXHIBIT F.

RECEIPTS AND DISBURSEMENTS FOR THE TWO FISCAL YEARS ENDING JUNE 30, 1898.

RECEIPTS.	1896-97.	1897-98.	Total.
Section 1, Seawall Wharf	$6,472 65	$7,851 12	$14,323 77
Section 2, Seawall Wharf	4,319 50	4,100 50	8,420 00
Section 3, Seawall Wharf	10,739 67	12,648 23	23,387 90
Section 4, Seawall Wharf	6,987 11	7,701 88	14,688 99
Fisherman's Wharf	4,309 25	3,919 25	8,228 50
Union Street Wharf	12,374 36	16,403 93	28,778 29
Green Street Wharf	18,482 77	15,342 00	33,824 77
Vallejo Street Wharf	10,945 50	9,416 94	20,362 44
Broadway Wharf, No. 1	16,425 10	18,542 68	34,967 78
Broadway Wharf, No. 2	14,296 70	14,387 64	28,684 34
Pacific Street Wharf	8,300 65	9,483 11	17,783 76
Jackson Street Wharf	16,511 23	15,389 76	31,900 99
Washington Street Wharf	16,277 79	15,542 73	31,820 52
Ferries	87,711 06	90,189 54	177,900 60
Mission Street Wharf	13,438 43	13,609 23	27,047 66
Mission Street Wharf, No. 2	23,264 10	25,098 11	48,362 21
Howard Street Wharf	12,213 20	12,541 96	24,755 16
Howard Street Wharf, No. 2	9,612 95	9,956 85	19,569 80
Howard Street Wharf, No. 3	8,444 01	7,946 75	16,390 76
Folsom Street Wharf	2,051 10	1,697 85	3,748 95
Folsom Street Wharf, No. 2	16,898 70	18,307 12	35,205 82
Harrison Street Wharf	8,276 58	9,723 06	17,999 64
Steuart Street Wharf	9,444 73	9,123 71	18,568 44
Spear Street Wharf	11,795 83	13,772 33	25,568 16
Main Street Wharf	13,015 30	15,011 55	28,026 85
Beale Street Wharf	18,941 28	21,544 06	40,485 34
Fremont Street Wharf	7,373 05	7,836 38	15,209 43
Third Street Wharf	7,001 35	5,905 65	12,907 00
Berry Street Wharf	12,861 10	7,543 86	20,404 96
Channel Street Wharf	4,708 59	4,480 65	9,189 24
Center Street Wharf	1,732 01	1,491 13	3,223 14
California Dry Dock	6,600 00	6,050 00	12,650 00
Pacific Mail Steamship Company	22,200 00	23,400 00	45,600 00
Southern Pacific Company (rent)	19,200 00	19,200 00	38,400 00
Southern Pacific Company (tolls)	55,220 00	59,172 98	114,392 98
United States Barge Office	240 00	40 00	280 00
Space for scales	900 00	960 00	1,860 00
Revenue from Seawall lots	12,120 00	11,660 80	23,780 80
Sale of old material (urgent repairs)	566 85	1,657 75	2,224 60
Sale of old material (Dredger No. 1)	9 75	----------	9 75
Sale of old material (Dredger No. 2)	30 00	----------	30 00
Central Basin	360 00	370 00	730 00
Belt Railroad revenue	27,219 25	28,413 50	55,632 75
Damages, wharfage, sales, etc.	1,231 55	1,191 96	2,423 51
China Basin	1,000 00	1,000 00	2,000 00
Rent U. S. Customs Department	----------	1,600 00	1,600 00
Duplication payroll, Dredger No. 1	----------	374 50	374 50
Duplication payroll, Sweepers	----------	60 00	60 00
	$562,123 05	$581,661 05	$1,143,784 10
Amount drawn from San Francisco Harbor Improvement Fund	226,419 29	189,813 94	416,233 23
Totals	$788,542 34	$771,474 99	$1,560,017 33

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EXHIBIT F—*Continued.*

RECEIPTS AND DISBURSEMENTS FOR THE TWO FISCAL YEARS ENDING JUNE 30, 1898.

DISBURSEMENTS.	1896-97.	1897-98.	Total.
Salaries of Commissioners, Secretaries, and Clerks	$20,640 00	$21,350 85	$41,990 85
Salaries of Chief Engineer and Assistants	7,200 00	7,273 40	14,473 40
Salaries of Chief Wharfinger and Assistant	4,758 05	5,154 05	9,912 10
Salary of Attorney	2,400 00	2,400 00	4,800 00
Salaries of Wharfingers	27,141 65	26,979 15	54,120 80
Salaries of Collectors	18,950 00	19,054 80	38,004 80
Salaries of Watchmen	5,844 00	7,761 55	13,605 55
Expense account	16,554 72	20,674 48	37,229 20
Urgent repairs	49,081 99	58,330 85	107,412 84
Repairs (contract)	131,613 46	103,400 41	235,013 87
Pile-driving	25,394 89	24,965 04	50,359 93
Cleaning wharves	28,809 18	34,872 20	63,681 38
Wharf offices and furniture	169 87	795 85	965 72
Legal expenses	841 20	6,078 05	6,919 25
Fire account	5,029 12	6,861 23	11,890 35
Dredger No. 1	12,420 43	19,689 00	32,109 43
Dredger No. 2	22,411 61	15,188 77	37,600 38
Tug Governor Markham	8,350 84	8,785 22	17,136 06
Tug Governor Irwin	12,503 43	10,615 82	23,119 25
Construction account	112,995 21	126,906 81	239,902 02
Seawall account	6,658 01	----------	6,658 01
Dockage refunded	544 40	431 70	976 10
Tolls refunded	85 25	247 95	333 20
Wharfage refunded	9 45	----------	9 45
Rent refunded	----------	48 00	48 00
Belt Railroad expense	11,422 57	18,458 63	29,881 20
Damages, wharfage, sales, etc.	100 80	448 53	549 33
	$531,930 13	$546,772 34	$1,078,702 47
Remitted to State Treasurer, account San Francisco Harbor Improvement Fund	256,612 21	224,702 65	481,314 86
Totals	$788,542 34	$771,474 99	$1,560,017 33

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EXHIBIT G.

STATEMENT OF SAN FRANCISCO HARBOR IMPROVEMENT FUND FOR TWO FISCAL YEARS ENDING JUNE 30, 1898.

RECEIPTS.

1896—Aug.	To amount remitted by Commissioners for July	$13,254 89	
Sept.	To amount remitted by Commissioners for Aug.	17,296 69	
Oct.	To amount remitted by Commissioners for Sept.	23,606 24	
Nov.	To amount remitted by Commissioners for Oct.	26,686 83	
Dec.	To amount remitted by Commissioners for Nov.	31,016 51	
1897—Jan.	To amount remitted by Commissioners for Dec.	27,802 29	
Feb.	To amount remitted by Commissioners for Jan.	22,474 81	
March	To amount remitted by Commissioners for Feb.	18,851 87	
April	To amount remitted by Commissioners for Mar.	19,554 04	
May	To amount remitted by Commissioners for Apr.	21,574 51	
June	To amount remitted by Commissioners for May	19,561 28	
July	To amount remitted by Commissioners for June	14,932 25	
			$256,612 21
1897—Aug.	To amount remitted by Commissioners for July	$17,789 56	
Sept.	To amount remitted by Commissioners for Aug.	13,079 52	
Oct.	To amount remitted by Commissioners for Sept.	23,597 81	
Nov.	To amount remitted by Commissioners for Oct.	23,903 45	
Dec.	To amount remitted by Commissioners for Nov.	23,288 05	
1898—Jan.	To amount remitted by Commissioners for Dec.	16,219 80	
Feb.	To amount remitted by Commissioners for Jan.	14,703 98	
March	To amount remitted by Commissioners for Feb.	18,931 98	
April	To amount remitted by Commissioners for Mar.	20,790 48	
May	To amount remitted by Commissioners for Apr.	17,873 73	
June	To amount remitted by Commissioners for May	17,680 72	
July	To amount remitted by Commissioners for June	16,843 57	
			224,702 65
	Total amount remitted		$481,314 86
	Balance in S. F. Harbor Imp. F'd, July, 1896		82,444 93
			$563,759 79

DISBURSEMENTS.

Date.	Order.	No.	On Account of—	Amount.
1896.				
July 1	Teredo Proof Pile Co.	854	Piles	$1,568 00
2		855	Void	
21	Teredo Proof Pile Co.	856	Piles	1,438 50
23	S. E. Slade Lumber Co.	857	Lumber	3,614 94
23	Darby Laydon & Co.	858	Piles	593 13
28	Teredo Proof Pile Co.	859	Piles	962 50
28	Paraffine Paint Co.	860	Coating piles	2,422 01
30	Main St. Iron Works	861	Alterations to mach. "Gov. Irwin"	1,200 00
Aug. 4	Atlas Iron Works	862	Hydraulic hoist for Ferry Slip No. 1	1,228 50
6	Teredo Proof Pile Co.	863	Piles	1,680 00
6	Healy, Tibbitts & Co.	864	Repiling and repairing Ferry Slip No. 1	2,403 56
6	Healy, Tibbitts & Co.	865	Post Office building	2,777 63
18	Darby Laydon & Co.	866	Piles	2,205 39
25	Teredo Proof Pile Co.	867	Piles	2,107 00
27	S. E. Slade Lumber Co.	868	Lumber	3,761 25
Sept. 8	Teredo Proof Pile Co.	869	Piles	2,222 50
15	Healy, Tibbitts & Co.	870	Shed on Pier No. 7, Pacific St. Wharf	4,049 18
15	Healy, Tibbitts & Co.	871	Repairs to Ferry Slip No. 1	2,403 96
15	James A. McMahon	872	Pier No. 12, Folsom St. No. 1	12,525 00
15	Healy, Tibbitts & Co.	873	Post Office building	2,452 37
15	Atlas Iron Works	874	Hydraulic hoist, Slip No. 1	409 50
22	S. E. Slade Lumber Co.	875	Lumber	3,551 61
24	Teredo Proof Pile Co.	876	Piles	1,830 50
Oct. 9	San Fran. Bridge Co.	877	Repairing and repiling outer half Bryant Street	4,785 04
15	Teredo Proof Pile Co.	878	Piles	2,674 00

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EXHIBIT G—SAN FRANCISCO HARBOR IMPROVEMENT FUND—DISBURSEMENTS—*Continued.*

Date.	Order.	No.	On Account of—	Amount.
1896.				
Oct. 27	James A. McMahon	879	Constructing Pier No. 12, Folsom No. 1	$3,551 29
27	Darby Laydon & Co.	880	Piles	536 45
27	Pacific Pine Lum. Co.	881	Piles	217 56
27	S. E. Slade Lumber Co.	882	Lumber	4,015 33
29	Teredo Proof Pile Co.	883	Piles	437 50
Nov. 12	S. F. Timber Preserving Co.	884	Piles creosoted	2,139 25
19	S. F. Timber Preserving Co.	885	Creosoting piles	1,468 75
19	S. F. Timber Preserving Co.	886	Creosoting piles	541 75
24	Pacific Pine Lum. Co.	887	Piles	996 79
27	S. E. Slade Lumber Co.	888	Lumber	3,333 14
Dec. 8	Pacific Pine Lum. Co.	889	Piles	1,217 90
8	S. F. Timber Preserving Co.	890	Creosoting piles	2,337 25
8	S. F. Timber Preserving Co.	891	Creosoting timber for Pier No. 12	2,127 22
8	James A. McMahon	892	Constructing Pier No. 12	3,687 19
8	H. R. Rood & Co.	893	Coating piles	970 80
8	Darby Laydon & Co.	894	Constructing Sec. "B," Seawall	2,922 95
17	Paraffine Paint Co.	895	Coating piles	1,665 57
17	S. F. Timber Preserving Co.	896	Creosoting piles	980 00
22	H. R. Rood & Co.	897	Coating piles	576 00
22	Darby Laydon & Co.	898	Widening approach to Fremont St.	1,186 00
22	S. E. Slade Lumber Co.	899	Lumber	4,400 41
1897.				
Jan. 5	James A. McMahon	900	Constructing Pier No. 12	6,454 31
12	San Fran. Bridge Co.	901	Extending pier between Fremont and P. M. S. S. Co.'s Pier	4,414 65
12	Pacific Pine Lum. Co.	902	Piles	814 26
12	S. F. Timber Preserving Co.	903	Creosoting piles and lumber	5,448 82
12	Reddy, Campbell & Metson	904	Attorneys for various persons constructing Sec. "B," Seawall	1,936 81
14	S. F. Timber Preserving Co.	905	Creosoting piles	663 00
26	Paraffine Paint Co.	906	Coating piles	1,702 15
26	S. E. Slade Lumber Co.	907	Lumber	2,875 18
26	Pacific Pine Lum. Co.	908	Piles	877 26
28	Pacific Pine Lum. Co.	909	Piles	1,306 62
28	S. F. Timber Preserving Co.	910	Creosoting piles	3,456 75
28	H. A. Powell	911	Constructing Sec. "B," Seawall	1,356 95
Feb. 2	Alex. L. Campbell	912	Constructing shed on Pier between Fremont St. & P. M. S. S. Co.'s	1,998 15
4	James A. McMahon	913	Repiling and repairing Pier No. 11, Broadway No. 2	1,711 50
4	Pacific Pine Lum. Co.	914	Piles	731 15
16	H. R. Rood & Co.	915	Coating piles	2,040 00
18	Paraffine Paint Co.	916	Coating piles	435 13
18	R. D. Chandler and Elizabeth Kerr as executor and executrix of the estate of Wm. Kerr, deceased	917	Constructing Sec. "B," Seawall	441 30
23	S. E. Slade Lumber Co.	918	Lumber	4,620 24
23	Pacific Pine Lum. Co.	919	Piles	880 56
25	Pacific Pine Lum. Co.	920	Piles	927 58
25	H. R. Rood & Co.	921	Coating piles	880 00
Mar. 2	Alex. L. Campbell	922	Constructing shed on pier between Fremont St. & P. M. S. S. Co.'s	1,089 90
4	S. F. Timber Preserving Co.	923	Creosoting	4,959 43
4	S. F. Timber Preserving Co.	924	Creosoting piles	1,372 75

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EXHIBIT G—SAN FRANCISCO HARBOR IMPROVEMENT FUND—DISBURSEMENTS—*Continued.*

Date.	Order.	No.	On Account of—	Amount.
1897.				
Mar. 4	S. F. Timber Preserving Co.	925	Creosoting piles	$1,661 25
23	H. R. Rood & Co.	926	Coating piles	5,834 40
23	S. F. Timber Preserving Co.	927	Cresoting piles	4,061 25
23	Pacific Pine Lum. Co.	928	Piles	574 21
25	S. E. Slade Lumber Co.	929	Lumber	4,075 49
25	Pacific Pine Lum. Co.	930	Piles	1,158 79
25	S. F. Timber Preserving Co.	931	Creosoting piles	297 00
30	James A. McMahon	932	Constructing Pier No. 12	13,519 25
Apr. 1	Risdon Iron & Locomotive Works	933	Flagpole and time-ball service	1,435 00
15	Alex. L. Campbell	934	Constructing shed on pier between Fremont St. & P. M. S. S. Co.'s	1,818 15
15	James A. McMahon	935	Repiling Vallejo St. Wharf	612 16
15	Healy, Tibbitts & Co.	936	Repiling and repairing Powell St. Wharf	1,373 00
15	Darby Laydon & Co.	937	Piles	99 24
22	Thomas H. Day	938	Shed on Pier No. 12, Folsom No. 1	2,100 00
29	S. E. Slade Lumber Co.	939	Lumber	2,110 91
May 10	Darby Laydon & Co.	940	Piles	1,862 72
10	S. F. Timber Preserving Co.	941	Creosoting	3,498 00
19	Thomas H. Day	942	Shed on Pier No. 12, Folsom No. 1	4,559 00
19	S. F. Timber Preserving Co.	943	Creosoting timber for Pier No. 7	2,198 00
27	Darby Laydon & Co.	944	Piles	819 87
June 3	Vulcan Iron Works	945	Hydraulic hoist, Second St.	1,790 00
3	H. R. Rood & Co.	946	Coating piles	1,260 00
15	Thomas H. Day	947	Branch Receiving Hospital	1,283 50
24	S. E. Slade Lumber Co.	948	Lumber	3,685 33
24	Darby Laydon & Co.	949	Piles	915 95
24	Vulcan Iron Works	950	Hydraulic hoist, Slip No. 4	1,324 00
24	H. R. Rood & Co.	951	Coating piles	1,901 60
24	H. R. Rood & Co.	952	Coating piles	649 60
29	S. E. Slade Lumber Co.	953	Lumber	2,372 00
			Total drawn for fiscal year 1896-97	$226,419 29
July 6	James A. McMahon	954	Repiling and reparing Steuart St.	$1,332 04
22	Healy, Tibbitts & Co.	955	Trussing superstructure, Pier No. 7	1,397 34
22	Redwood Lumber Co.	956	Paving approach to Pier No. 12	434 28
27	Darby Laydon & Co.	957	Piles	959 15
27	Darby Laydon & Co.	958	Repairs to Spear Street Wharf	2,289 32
Aug. 10	Vulcan Iron Works	959	Hydraulic hoists, Slip No. 3	2,448 00
10	S. F. Timber Preserving Co.	960	Creosoting	1,954 25
10	H. R. Rood & Co.	961	Coating piles	1,468 00
10	H. Wangenheim	962	Two Jewell filters	1,950 00
24	S. F. Timber Preserving Co.	963	Creosoting piles	3,154 50
27	S. E. Slade Lumber Co.	964	Lumber	5,403 91
27	Darby Laydon & Co.	965	Piles	2,681 54
31	S. E. Slade Lumber Co.	966	Lumber	5,583 18
Sept. 14	Healy, Tibbitts & Co.	967	Repiling and repairing Sec. B, 1, 2, 3, Seawall	2,773 75
14	Vulcan Iron Works	968	Hydraulic hoist, Slip No. 2	1,224 00
14	S. F. Timber Preserving Co.	969	Creosoting piles	514 00
16	S. F. Timber Preserving Co.	970	Creosoting	4,565 75
Oct. 5	Pacific Pine Lum. Co.	971	Piles	85 46
5	Vulcan Iron Works	972	Hydraulic hoists, Slips 4, 5, 6	1,836 00
5	James A. McMahon	973	Repiling Sec. 4 and Fisherman's Wharf	1,225 00
5	S. F. Timber Preserving Co.	974	Creosoting piles	400 00
29	Darby Laydon & Co.	975	Piles	2,481 73

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EXHIBIT G—SAN FRANCISCO HARBOR IMPROVEMENT FUND—DISBURSEMENTS—*Continued.*

Date.	Order.	No.	On Account of—	Amount.
1897.				
Nov. 2	Vulcan Iron Works	976	Hydraulic hoists	$1,836 00
2	S. E. Slade Lumber Co.	977	Lumber	4,529 75
2	S. E. Slade Lumber Co.	978	Lumber	5,201 02
10	Thomson Bridge Co.	979	Reconstructing Pier No. 12	4,112 25
18	H. R. Rood & Co.	980	Coating piles	2,364 40
24	Darby Laydon & Co.	981	Piles	2,622 96
30	S. E. Slade Lumber Co.	982	Lumber	4,612 82
Dec. 7	Thomas Day	983	Shed on approach to Slip No. 7	1,325 00
21	C. F. McCarthy	984	Terra cotta, etc., Station "D," P. O.	270 00
28	S. E. Slade Lumber Co.	985	Lumber	3,119 18
28	Darby Laydon & Co.	986	Piles	1,326 08
28	Darby Laydon & Co.	987	Repiling and repairing Pier No. 9	4,388 71
28	Herrin-Hall-Marvin Co.	988	Vault lining, Station "D," P. O.	375 00
1898.				
Jan. 4	S. F. Timber Preserving Co.	989	Burnettizing	3,805 56
11	Ed. B. Hindes & Co.	990	Wooden shutters, Station "D," P.O.	102 00
11	J. D. Spreckels & Bros. Co.	991	Cement	1,410 00
18	Cahill-Hall Elevator Co.	992	Elevator, Station "D," P. O.	882 30
18	S. F. Timber Preserving Co.	993	Burnettizing	55 36
20	E. James Duffy	994	Leader pipes for passenger bridges	324 00
25	Thomson Bridge Co.	995	Reconstructing Pier No. 12	4,744 10
28	E. James Duffy	996	Plumbing, Station "D," P. O.	557 00
28	Bateman Bros.	997	Carpenter work, Station "D," P. O.	2,989 00
28	Geo. J. Smith & Sons	998	Painting, Station "D," P. O.	275 00
28	Darby Laydon & Co.	999	Piles	1,511 91
Feb. 4	S. E. Slade Lumber Co.	1000	Lumber	4,300 88
4	J. D. Spreckels & Bros. Co.	1001	Cement	1,527 50
11	C. F. McCarthy	1002	News stands, etc.	2,915 00
11	Darby Laydon & Co.	1003	Piles	3,592 78
11	S. F. Bridge Co.	1004	Repairing Lombard and Beale Street Wharves	1,372 09
18	Redwood Standard Blk. Paving Co.	1005	Paving Pier No. 12	2,945 28
18	Bateman Bros.	1006	Wooden floors on approach to ferry slips	2,156 00
25	S. E. Slade Lumber Co.	1007	Lumber	3,854 86
25	S. F. Bridge Co.	1008	Repiling and repairing Pier No. 5	1,368 49
25	Darby Laydon & Co.	1009	Piles	623 95
25	S. F. Timber Preserving Co.	1010	Creosoting	2,802 50
Mar. 4	Thomson Bridge Co.	1011	Foundation for boiler	2,994 00
4	Thomas Day	1012	Constructing shed on Pier No. 12	1,601 10
4	Gray Bros.	1013	Concrete floor on approach to ferry slips	1,125 00
11	J. D. Spreckels & Bros. Co.	1014	Cement	1,645 00
11	S. F. Bridge Co.	1015	Repairs Mission No. 1	1,762 94
17	Bateman Bros.	1016	News stands	2,947 00
17	Cal. Art. Metal W'ks	1017	Guard railings	300 00
17	Cal. Art. Metal W'ks	1018	Mail box, brass grilles, Station "D"	365 75
24	S. F. Timber Preserving Co.	1019	Creosoting piles	1,921 75
24	Healy, Tibbitts & Co.	1020	Rebuilding and widening Green St.	1,872 36
31	Darby Laydon & Co.	1021	Piles	381 10
24	S. E. Slade Lumber Co.	1022	Lumber	1,211 76
24	Joshua Hendy Machine Works	1023	Iron curb	295 00
April 5	Pacific Bridge Co.	1024	Approaches to ferry slips	6,786 50
5	C. F. McCarthy	1025	Marble front for counter	295 00
5	Gray Bros.	1026	Concrete floors on approach to ferry slips	750 00

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EXHIBIT G—SAN FRANCISCO HARBOR IMPROVEMENT FUND—DISBURSEMENTS—*Continued.*

Date.	Order.	No.	On Account of—	Amount.
1898.				
April 12	Thomas Day	1027	Shed on Pier No. 12	$5,514 90
12	J. D. Spreckels & Bros. Co.	1028	Cement	1,880 00
19	Babcock & Wilcox Co.	1029	Boiler, pumps, etc.	2,743 12
26	S. E. Slade Lumber Co.	1030	Lumber	2,778 74
26	Cal. Art. Metal W'ks	1031	Grille partitions	1,865 00
26	Geo. B. Campbell	1032	Offices on Pier No. 12	763 00
May 10	P. J. O'Neill	1033	Painting and whitewashing Pier No. 12	730 00
17	Pacific Bridge Co.	1034	Approaches to ferry slips	1,162 50
25	Geo. B. Campbell	1035	Shed on pier between Slips 3 and 4	1,420 20
26	S. E. Slade Lumber Co.	1036	Lumber	3,671 97
June 8	W. W. Montague & Co.	1037	Approaches to Slips 2, 3, 4, 5, 6	2,100 00
8	Braidi & Pasquali	1038	Approaches to slips	800 00
8	Darby Laydon & Co.	1039	Piles	200 65
17	Duffey Bros.	1040	Plumbing approaches to ferry slips	382 66
17	Gray Bros.	1041	Concrete floors on approaches to ferry slips	1,361 58
21	Cal. Artistic Metal and Wire Works	1042	Brass railings	325 00
28	Darby Laydon & Co.	1043	Piles	236 92
28	E. Howard Watch and Clock Co.	1044	Clock	2,550 00
	Void	1045		
28	Geo. B. Campbell	1046	Repairing dolphin bet. Slips 3 and 4	974 48
28	S. E. Slade Lumber Co.	1047	Lumber	3,859 03
28	J. D. Spreckels & Bros. Co.	1048	Cement	1,880 00
				$77,205 09

Total amount drawn for fiscal year 1897-98	$189,813 94
Total amount drawn for fiscal year 1896-97	226,419 29
Total amount drawn from San Francisco Harbor Improvement Fund for the two fiscal years ending June 30, 1898	$416,233 23
Total amount transferred to San Francisco Depot Sinking Fund for the two fiscal years ending June 30, 1898	111,144 00
Balance in San Francisco Harbor Improvement Fund June 30, 1898	36,382 56
	$563,759 79

EXHIBIT H.

DISBURSEMENTS FROM SAN FRANCISCO DEPOT FUND.

Date.	Order.	No.	On Account of Union Depot and Ferry House.	Amount.
1896.				
July 2	Risdon Iron and Locomotive Works	4	Iron work	$2,982 90
9	Bateman Bros.	5	Carpentering, plastering, glazing	1,060 50
21	Edward R. Swain	6	Architect fees	335 47
Aug. 4	Risdon Iron and Locomotive Works	7	Iron work	55,745 23
4	Edward R. Swain	8	Architect fees	1,514 81
11	Bateman Bros.	9	Carpentering, plastering, glazing	5,115 00
Sept. 3	Risdon Iron and Locomotive Works	10	Iron work	12,180 14
3	Edward R. Swain	11	Architect fees	324 80
Oct. 1	Risdon Iron and Locomotive Works	12	Iron work	14,676 42
1	Edward R. Swain	13	Architect fees	391 37

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EXHIBIT H—SAN FRANCISCO DEPOT FUND—DISBURSEMENTS—*Continued.*

Date.	Order.	No.	On Account of Union Depot and Ferry House.	Amount.
1896.				
Nov. 5	Risdon Iron and Locomotive Works	14	Iron work	$21,048 62
10	Edward R. Swain	15	Architect fees	697 69
Dec. 3	Risdon Iron and Locomotive Works	16	Iron work	16,975 42
3	Edward R. Swain	17	Architect fees	452 67
8	Risdon Iron and Locomotive Works	18	Iron work	729 30
17	Risdon Iron and Locomotive Works	19	Iron work	1,550 00
17	C. F. McCarthy	20	Masonry work	4,641 00
1897.				
Jan. 5	Risdon Iron and Locomotive Works	21	Iron work	1,449 00
5	Edward R. Swain	22	Architect fees	310 17
12	Bateman Bros.	23	Carpentering, plastering, glazing	972 00
Feb. 2	Edward R. Swain	24	Architect fees	302 95
2	C. F. McCarthy	25	Masonry work	2,641 00
2	E. James Duffey	26	Plumbing and gasfitting	5,067 80
4	Risdon Iron and Locomotive Works	27	Iron work	600 00
Mar. 2	C. F. McCarthy	28	Masonry work	11,171 44
2	E. James Duffey	29	Plumbing and gasfitting	2,747 79
2	Edward R. Swain	30	Architect fees	1,195 57
4	J. D. Spreckels & Bros. Co.	31	Cement	129 25
16	Bateman Bros.	32	Carpentering, plastering, glazing	1,125 72
Apr. 1	C. F. McCarthy	33	Masonry work	9,315 00
1	Risdon Iron and Locomotive Works	34	Iron work	716 85
6	E. James Duffey	35	Plumbing and gasfitting	2,466 03
6	Edward R. Swain	36	Architect fees	366 68
6	J. D. Spreckels & Bros. Co.	37	Cement	646 25
22	Bateman Bros.	38	Carpentering, plastering, glazing	1,404 84
29	C. F. McCarthy	39	Masonry work	11,540 25
May 10	E. James Duffey	40	Plumbing and gasfitting	847 65
10	Edward R. Swain	41	Architect fees	647 82
10	J. D. Spreckels & Bros. Co.	42	Cement	1,880 00
27	C. F. McCarthy	43	Masonry work	19,290 30
27	William Cronan	44	Galvanized iron work	2,087 35
27	Risdon Iron and Locomotive Works	45	Iron work	539 15
27	Edward R. Swain	46	Architect fees	738 88
June 3	J. D. Spreckels & Bros. Co.	47	Cement	3,055 00
24	Bateman Bros.	48	Carpentering, plastering, glazing	2,094 32
24	Risdon Iron and Locomotive Works	49	Iron work	300 00
29	C. F. McCarthy	50	Masonry work	13,475 25
29	William Cronan	51	Galvanized iron work	6,644 61
29	Edward R. Swain	52	Architect fees	607 36
			Total drawn for fiscal year 1896–97	$246,797 62
July 13	J. D. Spreckels & Bros. Co.	53	Cement	$3,055 00
27	C. F. McCarthy	54	Masonry work	17,330 25
27	Edward R. Swain	55	Architect fees	889 76
27	W. W. Montague & Co.	56	"Heating"	2,428 53
28	Wm. Cronan	57	Galvanized iron work	6,426 03
Aug. 10	Bateman Bros.	58	Carpentering, plastering, glazing	2,247 57
10	J. D. Spreckels & Bros. Co.	59	Cement	2,232 50
Sept. 7	J. D. Spreckels & Bros. Co.	60	Cement	117 50
10	Edward R. Swain	61	Architect fees	701 25
10	C. F. McCarthy	62	Masonry work	13,717 80
10	Wm. Cronan	63	Galvanized iron work	9,064 71
10	Bateman Bros.	64	Carpentering, plastering, glazing	1,965 00

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EXHIBIT H—SAN FRANCISCO DEPOT FUND—DISBURSEMENTS—*Continued.*

Date.	Order.	No.	On Account of Union Depot and Ferry House.	Amount.
1897.				
Sept. 10	Geo. J. Smith & Sons	65	Painting	$1,551 04
Oct. 5	C. F. McCarthy	66	Masonry work	9,681 00
5	Edward R. Swain	67	Architect fees	506 29
5	Wm. Cronan	68	Galvanized iron work	4,617 50
5	Edw. B. Hindes & Co.	69	Rolling wooden doors	1,039 50
5	Edw. B. Hindes & Co.	70	Rolling wooden doors	835 50
12	Bateman Bros.	71	Carpentering, plastering, glazing	6,026 25
12	J. D. Spreckels & Bros. Co.	72	Cement	235 00
Nov. 2	Edward R. Swain	73	Architect fees	917 52
2	Risdon Iron & L. Wks.	74	Iron work	4,575 00
2	Bateman Bros.	75	Carpentering, plastering, glazing	4,361 25
2	Wm. Cronan	76	Galvanized iron work	5,520 00
2	C. F. McCarthy	77	Masonry work	8,516 53
10	J. D. Spreckels & Bros. Co.	78	Cement	705 00
10	Edw. B. Hindes & Co.	79	Rolling wooden doors	846 00
10	Edw. B. Hindes & Co.	80	Rolling wooden doors	922 50
10	Geo. J. Smith & Sons	81	Painting	1,211 25
30	Bateman Bros.	82	Carpentering, plastering, glazing	11,040 25
30	C. F. McCarthy	83	Masonry work	15,591 75
30	Edward R. Swain	84	Architect fees	1,571 44
30	Wm. Cronan	85	Galvanized iron work	2,875 00
30	Geo. J. Smith & Sons	86	Painting	2,163 75
Dec. 2	Risdon Iron & L. Wks.	87	Iron work	1,076 83
7	Risdon Iron & L. Wks.	88	Iron work	2,970 00
28	W. W. Montague & Co.	89	"Heating"	1,320 00
28	Geo. J. Smith & Sons	90	Painting	1,683 75
28	C. F. McCarthy	91	Masonry work	15,808 50
28	Edward R. Swain	92	Architect fees	452 05
1898.				
Jan. 4	J. D. Spreckels & Bros. Co.	93	Cement	235 00
4	Bateman Bros.	94	Carpentering, plastering, glazing	2,700 00
6	Risdon Iron & L. Wks.	95	Iron work	45,950 00
6	Bateman Bros.	96	Carpentering, plastering, glazing	2,230 45
11	Edw. B. Hindes & Co.	97	Rolling wooden doors	203 25
11	Edw. B. Hindes & Co.	98	Rolling wooden doors	334 50
18	Cal. Artistic Metal & Wire Co.	99	Steel collapsing gates	1,827 00
27	Geo. J. Smith & Sons	100	Painting	862 50
Feb. 4	C. F. McCarthy	101	Masonry work	10,700 14
4	Wm. Cronan	102	Galvanized iron work	1,425 00
4	Edward R. Swain	103	Architect fees	662 00
11	Bateman Bros.	104	Carpentering, plastering, glazing	1,012 50
18	C. F. McCarthy	105	Masonry work	487 38
18	Edw. B. Hindes & Co.	106	Rolling wooden doors	740 00
18	Edw. B. Hindes & Co.	107	Rolling wooden doors	653 75
25	C. F. McCarthy	108	Masonry work	7,185 75
25	Bateman Bros.	109	Carpentering, plastering, glazing	345 00
Mar. 4	Edward R. Swain	110	Architect fees	298 23
4	Cal. Artistic Metal & Wire Co.	111	Steel collapsing gates	609 00
11	Bateman Bros.	112	Carpentering, plastering, glazing	990 00
4	William Cronan	113	Galvanized iron work	2,956 00
17	Geo. J. Smith & Sons	114	Painting	1,200 00
24	Herrin-Hall-Marvin Co.	115	Vault necking and front	200 00
Apr. 5	Edward R. Swain	116	Architect fees	210 20
12	C. F. McCarthy	117	Masonry work	5,973 53
May 17	C. F. McCarthy	118	Masonry work	53,983 34
17	W. W. Montague & Co.	119	Heating	842 72
26	E. James Duffey	120	Plumbing	337 50
June 4	C. F. McCarthy	121	Masonry work	2,500 00
8	Bateman Bros.	122	Carpentering, plastering, glazing	418 30
21	Bateman Bros.	123	Carpentering, plastering, glazing	12,008 75
29	William Cronan	124	Galvanized iron work	1,025 30
				$93,977 25

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EXHIBIT H—SAN FRANCISCO DEPOT FUND—DISBURSEMENTS—*Continued.*

Total amount drawn for fiscal year 1897-98	$329,903 17
Total amount drawn for fiscal year 1896-97	246,797 62
Total amount drawn for two fiscal years ending June 30, 1898	$576,700 79
Amount drawn prior to June 30, 1896	9,597 44
Total amount drawn out to June 30, 1898	$586,298 23
Amount of fund	$600,000 00
Premium on sale of bonds	7,125 00
Total amount of fund	$607,125 00
Total amount drawn out to June 30, 1898	586,298 23
Balance in fund June 30, 1898	$20,826 77

EXHIBIT I.

STATEMENT OF THE SAN FRANCISCO DEPOT SINKING FUND.

1896—July 1	To am't transferred from S. F. Harbor Imp. Fund	$4,631 00	
Aug. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Sept. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Oct. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Nov. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Dec. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
1897—Jan. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Feb. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Mar. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
April 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
May 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
June 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
			$55,572 00
1897—July 1	To am't transferred from S. F. Harbor Imp. Fund	$4,631 00	
Aug. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Sept. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Oct. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Nov. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Dec. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
1898—Jan. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Feb. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
Mar. 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
April 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
May 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
June 1	To am't transferred from S. F. Harbor Imp. Fund	4,631 00	
			55,572 00
			$111,144 00
	Balance in Fund, June 30, 1896		189,871 00
			$301,015 00

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EXHIBIT J.

BALANCE SHEET—FROM NOVEMBER 4, 1863, TO JUNE 30, 1898.

RECEIPTS.			
From dockage, tolls, wharfage, rents, etc.			$14,902,665 50
DISBURSEMENTS.			
Salaries of Commissioners, Secretaries, Engineers, Attorneys, Wharfingers, and Collectors, law fees, fuel, electric lights, rent, stationery, etc.		$3,274,900 60	
Constructing and repairing wharves, sheds, etc.		6,489,112 68	
Constructing seawall and improving seawall lots		2,645,671 06	
Purchase of and constructing dredgers, tugs, and scows		208,847 45	
Dredging, cost of		1,610,531 56	
Payroll of crew of fire-boat		91,429 83	
Suspense account (defalcations)		5,460 55	
Miscellaneous (damages to wharves, dockage, tolls, rent returned, etc.)		51,276 94	
Constructing and operating Belt Railroad		188,037 27	
Cash in treasury		36,382 56	
Balance in S. F. Depot Sinking F'd June 30, 1896	$189,871 00		
Amount transferred to S. F. Depot Sinking Fund from July 1, 1896, to June 30, 1898	111,144 00	301,015 00	
			$14,902,665 50
Dr. CASH.			
To amount remitted to State Treasurer			$8,131,104 68
Cr. CASH.			
By amount drawn from State Treasury		$7,793,707 12	
By amount transferred to S. F. Depot Sinking Fund		301,015 00	
By cash on hand in treasury		36,382 56	
			$8,131,104 68

EXHIBIT K.

CONSTRUCTION ACCOUNT No. 1.

WORK UNDER WAY AT DATE OF LAST BIENNIAL REPORT, AND SINCE COMPLETED.

Constructing shed on Pier No. 7, Pacific Street Wharf. Date of contract, March 10, 1896. Healy, Tibbitts & Co., contractors.

Contract price	$7,893 00	
Additions to contract	400 00	
		$8,293 00
Paid prior to June 30, 1896	$4,143 82	
Sept. 15, 1896—Paid	4,049 18	
Less deduction for inferior painting	100 00	
		$8,293 00

Constructing shed on Pier No. 8, Howard Street Wharf No. 2. Date of contract, March 31, 1896. Galloway, Townley & Co., contractors.

Contract price		$2,654 00
Paid prior to June 30, 1896	$2,494 00	
Aug. 18, 1896—Paid	160 00	
		$2,654 00

Alterations and repairs to machinery of tug "Gov. Irwin." Date of contract, April 28, 1896. Main Street Iron Works, contractors.

Contract price		$2,700 00
Paid prior to June 30, 1896	$1,500 00	
July 30, 1896—Paid	1,200 00	
		$2,700 00

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Removing and rebuilding Pier No. 12, Folsom Street Wharf No. 1. Date of contract, June 2, 1896. James A. McMahon, contractor.

Contract price	$37,769 00	
Addition to contract	1,968 00	
		$39,737 00
Sept. 15, 1896—Paid	$12,525 00	
Oct. 27, 1896—Paid	3,551 25	
Dec. 8, 1896—Paid	3,687 19	
Jan. 5, 1897—Paid	6,454 31	
Mar. 30, 1897—Paid	13,519 25	
		$39,737 00

Repairing and rebuilding Bryant Street, between Main and Spear Streets. Date of contract, June 9, 1896. Galloway, Townley & Co., contractors.

Contract price—
$6 00 per pile driven and fastened.
14 75 per 1000 ft. (B. M.) new lumber furnished and laid.
50 cents per 1000 ft. (B. M.) old lumber laid.

Postoffice building, foot of Market Street. Date of contract, June 9, 1896. Healy, Tibbitts & Co., contractors.

Contract price	$4,938 00	
Addition to contract	292 00	
		$5,230 00
Aug. 6, 1896—Paid	$2,777 63	
Sept. 15, 1896—Paid	2,452 37	
		$5,230 00

Hydraulic hoist at Ferry Slip No. 1. Date of contract, June 18, 1896. Atlas Iron Works, contractors.

Contract price		$1,638 00
Aug. 4, 1896—Paid	$1,228 50	
Sept. 15, 1896—Paid	409 50	
		$1,638 00

Building for Spring Valley Water Company. Date of contract, June 18, 1896. Alexander L. Campbell, contractor.

Contract price	$543 00	
Addition to contract	20 25	
		$563 25
July 9, 1896—Paid		563 25

Repiling and repairing Ferry Slip No. 1. Date of contract, June 23, 1896. Healy, Tibbitts & Co., contractors.

Contract price	$4,273 00	
Addition to contract	534 52	
		$4,807 52
Aug. 6, 1896—Paid	$2,403 56	
Sept. 15, 1896—Paid	2,403 96	
		$4,807 52

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Repairs to Dredger No. 2 and water tank. Contract awarded June 30, 1896. John Twigg & Son, contractors.

Contract price	$1,543 00	
Additions to contract	3,230 00	
		$4,773 00
July 18, 1896—Paid	$900 00	
July 25, 1896—Paid	800 00	
Aug. 21, 1896—Paid	3,073 00	
		$4,773 00

EXHIBIT L.

CONSTRUCTION ACCOUNT No. 2.

WORK CONTRACTED FOR AND COMPLETED WITHIN THE YEARS JUNE 30,1896, TO JULY 1, 1898.

Repairing and rebuilding outer half of Bryant Street. Date of contract, August 6, 1896. San Francisco Bridge Co., contractors.

Contract price—		
$7 75 per pile driven and fastened.		
$13 88 per 1000 feet (B. M.) new lumber furnished and laid.		
$2 90 per 1000 feet (B. M.) old lumber furnished and laid.		
Amount of work—		
173 piles, at $7 75	$1,340 75	
242,816 feet (B. M.) new lumber, at $13 88	3,370 28	
12,770 feet (B. M.) old lumber, at $2 90	37 03	
Extras and work	36 98	
		$4,785 04
Oct. 12, 1896—Paid		4,785 04

Extending pier between Fremont and P. M. S. S. Co.'s pier. Date of contract, November 10, 1896. San Francisco Bridge Co., contractors.

Contract price	$4,281 00	
Additions to contract	133 65	
		$4,414 65
Jan. 12, 1897—Paid		4,414 65

Constructing shed on Pier No. 12 (Folsom Street No. 1). Date of contract, November 19, 1896. Thomas H. Day, contractor.

Contract price	$6,649 00	
Additions to contract	10 00	
		$6,659 00
April 22, 1897—Paid	$2,100 00	
May 19, 1897—Paid	4,559 00	
		$6,659 00

Widening approach to Fremont Street Pier. Date of contract, December 1, 1896. Darby Laydon & Co., contractors.

Contract price	$1,186 00
Dec. 22, 1896—Paid	1,186 00

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Repiling and repairing Pier No. 11 (Broadway No. 2). James A. McMahon, contractor. Date of contract, December 17, 1896.

Contract price—		
$3 75 per pile for standard piles.		
$2 85 per pile for fender piles.		
Amount of work—		
369 standard piles driven, at $3 75	$1,383 75	
115 fender piles driven, at $2 85	327 75	
		$1,711 50
Feb. 4, 1897—Paid		1,711 50

Shed on pier between Fremont Street and P. M. S. S. Co.'s pier. Alexander L. Campbell, contractor. Date of contract, December 29, 1896.

Contract price	$4,844 00	
Addition to contract	62 20	
		$4,906 20
Feb. 2, 1897—Paid	$1,998 15	
Mar. 2, 1897—Paid	1,089 90	
Apr. 15, 1897—Paid	1,818 15	
		4,906 20

Repiling and repairing Pier No. 13 (Vallejo Street). James A. McMahon, contractor. Date of contract, February 23, 1897.

Contract price	$498 00	
Addition to contract	114 16	
		$612 16
Apr. 15, 1897—Paid		612 16

Repiling and repairing Pier No. 51 (Powell Street). Healy, Tibbitts & Co., contractors. Date of contract, March 9, 1897.

Contract price	$1,373 00
Apr. 15, 1897—Paid	1,373 00

Elevator, Station "D," Post Office. Cahill-Hall Elevator Co., contractors. Date of contract, March 9, 1897.

Contract price	$730 00	
Addition to contract	152 30	
		$882 30
Jan. 18, 1898—Paid		882 30

Hydraulic hoist, Second Street. Vulcan Iron Works, contractors. Date of contract, March 22, 1897.

Contract price	$1,790 00
June 3, 1897—Paid	1,790 00

Hydraulic hoist, Ferry Slip No. 4. Vulcan Iron Works, contractors. Date of contract, April 20, 1897.

Contract price	$1,324 00
June 24, 1897—Paid	1,324 00

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Branch receiving hospital. Thomas H. Day, contractor. Date of contract, May 10, 1897.

Contract price	$1,195 00	
Addition to contract	88 50	
		$1,283 50
June 15, 1897—Paid		1,283 50

Paving Pier No. 12 (Folsom No. 1). Redwood Lumber Co., contractors. Date of contract, May 19, 1897.

Contract price: 11¾ cents per square foot.	
Area paved, 48x77 feet = 3,696 square feet, at 11¾ cents per square foot	$434 28
July 22, 1897—Paid	434 28

Repiling and repairing Steuart Street Wharf. James A. McMahon, contractor. Date of contract, May 24, 1897.

Contract price—		
$5 70 per pile under shed.		
5 15 per pile outside shed.		
Amount of work—		
Driving 32 piles under shed, at $5 70	$182 40	
Driving 77 piles outside shed, at $5 15	396 55	
Driving 45 fender piles, at $4 50	202 50	
Furnishing and driving one 40-foot fender pile	8 50	
Laying and fastening stringers and caps	22 34	
Furnishing, laying, and fastening comp. stringers, chocks, etc., 385 lineal feet, at $1 35	519 75	
		$1,332 04
July 6, 1897—Paid		1,332 04

Repiling and repairing Spear Street. Darby Laydon & Co., contractors. Date of contract, June 1, 1897.

Contract price—		
$4 70 per pile driven under shed.		
3 70 per pile driven.		
Amount of work—		
Laying, fitting, and fastening 33,144 feet (B. M.) of caps, chocks, and mudsills, at $8 per M	$265 15	
Laying, fitting, and fastening 59,659 feet (B. M.) of stringers, at $6 per M	357 95	
Laying, fitting, and fastening 101,845 feet (B. M.) of planks and curbs, at $5 per M	509 22	
Driving and fastening 268 standard, fender, and mooring piles, at $3 70	991 60	
Driving and fastening 22 standard piles under shed, at $4 70	103 40	
Resetting one mooring bit and furnishing bolts for same	5 00	
Blocking up 114 piles under shed, at 50 cents	57 00	
		$2,289 32
July 27, 1897—Paid		2,289 32

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Jewell filters, Union Depot. H. Wangenheim, contractor. Date of contract, June 2, 1897.

Contract price		$1,950 00
Aug. 10, 1897—Paid		1,950 00

Hydraulic hoists for Ferry Slips Nos. 3 and 4. Vulcan Iron Works, contractors. Date of contract, June 30, 1897.

Contract price		$2,448 00
Aug. 10, 1897—Paid	$1,224 00	
Oct. 5, 1897—Paid	612 00	
Nov. 2, 1897—Paid	612 00	
		2,448 00

Hydraulic hoists for Ferry Slips Nos. 2 and 3. Vulcan Iron Works, contractors. Date of contract, July 29, 1897.

Contract price		$2,448 00
Aug. 10, 1897—Paid	$1,224 00	
Sept. 14, 1897—Paid	1,224 00	
		2,448 00

Repiling and repairing Sections "B," 1, 2, and 3, Seawall. Healy, Tibbitts & Co., contractors. Date of contract, July 13, 1897.

Contract price	$1,693 00	
and $3 55 per pile for additional standard or fender piles.		
Extra work—		
Driving 5 cluster piles, 4 spring piles, 12 standard piles, and 4 posts in Section "B"; 20 standard piles, and 220 fender piles in Sections 1, 2, and 3—265 piles, at $3 55	940 75	
Extra bolting of 220 fender piles, at 50 cents	110 00	
Extra work on cluster	30 00	
		$2,773 75
Sept. 14, 1897—Paid		2,773 75

Repiling and repairing Section 4 of Seawall, and Bulkhead. James A. McMahon, contractor. Date of contract, August 10, 1897.

Contract price	$965 00	
Driving and fastening 52 extra piles, at $5 per pile	260 00	
		$1,225 00
Oct. 5, 1897—Paid		1,225 00

Reconstructing Pier No. 12 (Folsom No. 1). Thomson Bridge Co., contractors. Date of contract, August 24, 1897.

Contract price	$8,180 00	
Addition to contract	676 35	
		$8,856 35
Nov. 10, 1897—Paid	$4,112 25	
Jan. 25, 1898—Paid	4,744 10	
		8,856 35

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Hydraulic hoists, Ferry Slips Nos. 5 and 6. Vulcan Iron Works, contractors. Date of contract, August 9, 1897.

Contract price		$2,448 00
Oct. 5, 1897—Paid	$1,224 00	
Nov. 2, 1897—Paid	1,224 00	
		2,448 00

Constructing shed on Pier No. 12 (Folsom No. 1). Thomas H. Day, contractor. Date of contract, September 27, 1897.

Contract price		$7,116 00
Mar. 4, 1898—Paid	$1,601 10	
Apr. 12, 1898—Paid	5,514 90	
		7,116 00

Repiling and repairing Pier No. 9 (Broadway No. 1). Darby Laydon & Co., contractors. Date of contract, October 26, 1897.

Contract price	$3,072 00	
Addition to contract	1,316 71	
		$4,388 71
Dec. 28, 1897—Paid		4,388 71

Building a shed on approach to Ferry Slip No. 7. Thomas H. Day, contractor. Date of contract, November 2, 1897.

Contract price		$1,325 00
Dec. 7, 1897—Paid		1,325 00

Burnettizing timber used in construction of Pier No. 12. San Francisco Timber Preserving Co., contractors. Date of contract, November 2, 1897.

Contract price: $14 per M.		
Amount burnettized, 275,780 ft., at $14 per M.		$3,860 92
Jan. 4, 1898—Paid	$3,805 56	
Jan. 18, 1898—Paid	55 36	
		3,860 92

Carpentering, plastering, and glazing, Station "D," Post Office. Bateman Bros., contractors. Date of contract, November 20, 1897.

Contract price	$2,989 00
Jan. 28, 1898—Paid	2,989 00

Plumbing, Station "D," Post Office. E. James Duffey, contractor. Date of contract, November 11, 1897.

Contract price	$557 00
Jan. 28, 1898—Paid	557 00

Rolling wooden shutters, Station "D," Post Office. Edward B. Hindes & Co., contractor. Date of contract, November 11, 1897.

Contract price	$102 00
Jan. 11, 1898—Paid	102 00

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Vault and door, Station "D," Post Office. Herrin-Hall-Marvin Co., contractors. Date of contract, November 24, 1897.

Contract price	$375 00
Dec. 28, 1897—Paid	375 00

Terra cotta, etc., Station "D," Post Office. C. F. McCarthy, contractor. Date of contract, November 24, 1897.

Contract price	$270 00
Dec. 28, 1897—Paid	270 00

Mail box and grille work, Station "D," Post Office. California Artistic Metal and Wire Co., contractors. Date of contract, November 24, 1897.

Contract price	$365 75
Mar. 17, 1898—Paid	365 75

Painting, Station "D," Post Office. George J. Smith & Sons, contractors. Date of contract, December 14, 1897.

Contract price	$275 00
Jan. 28, 1898—Paid	275 00

Dolphin for Car Ferry Slip at foot of Lombard Street, and repairing Beale Street. San Francisco Bridge Co., contractors. Date of contract, December 21, 1897.

Contract price—		
Dolphin at Car Ferry Slips	$677 10	
$23 75 per M. for furnishing, etc., new lumber Beale Street.		
$6 80 per M. for refitting, etc., old lumber Beale Street.		
$5 82 for driving, etc., each new pile Beale Street.		
Furnishing and laying 18,216 ft. new lumber, at $23 75 per M.	432 63	
Relaying, etc., 24,032 ft. old lumber, at $6 80 per M.	163 42	
Driving 12 new piles, at $5 82	69 84	
Redriving 5 old piles, at $5 82	29 10	
		$1,372 09
Feb. 11, 1898—Paid		1,372 09

Ticket windows, Union Depot. C. F. McCarthy, contractor. Date of contract, December 14, 1897.

Contract price	$2,915 00
Feb. 11, 1898—Paid	2,915 00

Partitions between waiting-rooms, Union Depot. California Artistic Metal and Wire Co., contractors. Date of contract, January 4, 1898.

Contract price	$1,865 00
Apr. 26, 1898—Paid	1,865 00

News stand (marble), Union Depot. C. F. McCarthy, contractor. Date of contract, January 11, 1898.

Contract price	$295 00
Apr. 5, 1898—Paid	295 00

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Leader pipes for passenger bridges, Union Depot. Duffey Bros., contractors. Date of contract, January 11, 1898.

Contract price		$324 00
Jan. 20, 1898—Paid		324 00

News stands, first and second floors, Union Depot. Bateman Bros., contractors. Date of contract, January 11, 1898.

Contract price (1st floor, $1,397 00; 2d floor, $1,585 00)	$2,982 00	
Deduction from	35 00	
		$2,947 00
Mar. 17, 1898—Paid		2,947 00

Wooden floors on approaches to Ferry Slips Nos. 2, 3, 4, 5, and 6. Bateman Bros., contractors. Date of contract, January 18, 1898.

Contract price	$2,156 00
Feb. 18, 1898—Paid	2,156 00

Repiling and repairing Pier No. 5 (Jackson Street Wharf). San Francisco Bridge Co., contractors. Date of contract, January 17, 1898.

Contract price—		
$5 64 per pile to drive, fit, and fasten under shed.		
2 36 per pile to drive, fit, and fasten outside shed.		
5 71 per M. to fit and fasten lumber.		
Driving 191 piles under shed, at $5 64 per pile	$1,077 24	
Driving 88 piles outside shed, at $2 36 per pile	207 68	
Laying and fastening 14,636 feet (B. M.) of curbs, chocks, stringers, and planking, at $5 71 per M.	83 57	
		$1,368 49
Feb. 25, 1898—Paid		1,368 49

Repiling and repairing Pier No. 2 (Mission No. 1). San Francisco Bridge Co., contractors. Date of contract, January 17, 1898.

Contract price—		
$5 64 per pile to drive, fit, and fasten under shed.		
2 36 per pile to drive, fit, and fasten outside shed.		
5 71 per M. to fit and fasten lumber.		
Driving, fitting, and fastening 83 piles outside shed, at $2 36 per pile	$195 88	
Driving, fitting, and fastening 260 piles under shed, at $5 64 per pile	1,466 40	
Fitting and fastening 17,620 feet (B. M.) lumber, at $5 71 per M.	100 66	
		$1,762 94
Mar. 11, 1898—Paid		1,762 94

Foundation for steam boiler. Thomson Bridge Co., contractors. Date of contract, January 17, 1898.

Contract price	$2,994 00
Mar. 4, 1898—Paid	2,994 00

Great Seal of the State of California in Union Depot. Braidi & Pasquali, contractors. Date of contract, February 11, 1898.

Contract price	$800 00
June 8, 1898—Paid	800 00

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Painting and whitewashing shed and office, Folsom No. 1. P. J. O'Neil, contractor. Date of contract, April 5, 1898.

Contract price	$780 00	
Deduction from contract	50 00	
		$730 00
May 10, 1898—Paid		730 00

Offices on Folsom Wharf No. 1. George B. Campbell, contractor. Date of contract, April 7, 1898.

Contract price	$763 00
Apr. 26, 1898—Paid	763 00

Extra work on approaches to Ferry Slips Nos. 2, 3, 4, 5, and 6. E. James Duffey, contractor. Date of contract, June 16, 1898.

Contract price	$382 66
June 18, 1898—Paid	382 66

EXHIBIT M.

CONSTRUCTION ACCOUNT No. 3.

WORK CONTRACTED FOR SINCE JUNE 30, 1896, BUT NOT YET COMPLETED.

Removing, rebuilding, and widening southerly half of Pier No. 15, Green Street Wharf. Healy, Tibbitts & Co., contractors. Date of contract, October 26, 1897.

Contract price	$17,832 00
Mar. 24, 1898—Paid	1,872 36

Clock machinery, etc., for tower, Union Depot. E. Howard Watch and Clock Co., contractors. Date of contract, November 3, 1897.

Contract price	$3,630 00
June 28, 1898—Paid	2,550 00

Changing heating pipes, Station "D," Post Office. W. W. Montague & Co., contractors. Date of contract, November 24, 1897.

Contract price	$64 00

Guard railings, Union Depot. California Artistic Metal and Wire Co., contractors. Date of contract, January 17, 1898.

Contract price	$462 00
Mar. 17, 1898—Paid	300 00

Concrete floors on approaches to Ferry Slips Nos. 2, 3, 4, 5, and 6. Gray Bros., contractors. Date of contract, January 17, 1898.

Contract price	$2,972 50	
Addition to contract	1,007 20	
		$3,979 70
Mar. 4, 1898—Paid	$1,125 00	
April 5, 1898—Paid	750 00	
June 17, 1898—Paid	1,361 58	
		$3,236 58

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Radiators, Union Depot. W. W. Montague & Co., contractors. Date of contract, January 28, 1898.

Contract price		$2,927 00
June 8, 1898—Paid		2,100 00

Sidewalk on approach to ferry slips. Pacific Bridge Co., contractors. Date of contract, February 4, 1898.

Contract price	$7,724 00	
Addition to contract	2,600 00	
		$10,324 00
April 25, 1898—Paid	$6,786 50	
May 17, 1898—Paid	1,162 50	
		$7,949 00

Steam boiler, pumps, tank, piping, etc. Babcock & Wilcox Co., contractors. Date of contract, February 4, 1898.

Contract price	$3,850 00
April 19, 1898—Paid	2,743 12

Firebox, boiler, and steam drum, Dredger No. 2. P. F. Dundon, contractor. Date of contract, February 18, 1898.

Contract price	$2,087 00

Replanking a portion of dolphin between Slips 3 and 4, and erecting a shed thereon. George B. Campbell, contractor. Date of contract, April 19, 1898.

Contract price	$2,367 00	
Addition to contract	177 68	
		$2,544 68
May 25, 1898—Paid	$1,420 20	
June 28, 1898—Paid	974 48	
		$2,394 68

Settees for Union Depot. Peterson & Schemp, contractors. Date of contract, May 17, 1898.

Contract price	$45 each

Cleaning windows, Union Depot. S. Marengo, contractor. Date of contract, May 11, 1898.

Contract price	$270 00

Repiling and repairing Lombard Street Wharf. San Francisco Bridge Company, contractors. Date of contract, May 24, 1898.

Contract price: $11 per pile driven outside shed; $13 30 per pile driven inside shed; $33 per M for lumber in place.

Repiling and repairing Spear Street Wharf. James A. McMahon, contractor. Date of contract, May 24, 1898.

Contract price: $13 15 per pile driven outside shed; $13 75 per pile driven under shed; $22 per M for lumber in place.

Pipe-line with hose reels, Union Depot. Duffey Bros., contractors. Date of contract, July 23, 1898.

Contract price	$1,105 00

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Steel lining for baggage rooms, Union Depot. Ralston Iron Works, contractors. Date of contract, May 31, 1898.

Contract price $367 00

Bulletin boards, Union Depot. San Francisco Novelty and Plating Works, contractors. Date of contract, May 31, 1898.

Contract price $426 00

Lamp posts, Union Depot. Thos. Day Co., contractors. Date of contract, May 17, 1898.

Contract price $498 00

EXHIBIT N.

CONSTRUCTION ACCOUNT No. 4.

SEAWALL.

It has been impossible to make any extension to the Seawall during the past two years. The cost of the construction of the approaches to Ferry Slips 2, 3, 4, 5, and 6, on which the Union Depot and Ferry House is erected, and the entire rebuilding of old wharves in a more substantial manner than has heretofore been attempted, but at greater expense, has depleted the San Francisco Harbor Improvement Fund. The policy adopted by the Board, of making all repairs to wharves, etc., of a more enduring character, has prevented accumulations of funds which could be spared for seawall construction. Another factor has been the transference, monthly, of the sum of $4,631 from the San Francisco Harbor Improvement Fund to the San Francisco Depot Sinking Fund. This drain upon the resources, amounting in two years to $111,144, would be about sufficient to complete a section of seawall one thousand feet in length.

The completed seawall has cost as follows:

Section.	Length—Feet.	Cost per Linear Foot.	Total Cost.
Section A, constructed in 1879–80	561	$152 61	$85,614 53
Section 1, constructed in 1878–79	1,000	165 63	165,631 40
Section 2, constructed in 1879–80	1,000	167 50	167,504 09
Section 3, constructed in 1879–81	1,000	235 50	235,049 51
Section 4, constructed in 1880–82	1,000	240 87	240,872 01
Section 5, constructed in 1883–84	1,000	169 89	169,893 57
Section 6, constructed in 1885–86	800	158 47	126,779 73
Section 7, constructed in 1887–89	1,000	109 32	109,327 99
Section 8b, constructed in 1888–90	450	248 50	111,629 12
Section B, constructed in 1890–93	1,000	114 60	114,601 18
Section 8a, constructed in 1891–93	392	219 41	86,008 09
Totals	9,203	Av., $175 26	$1,612,911 22

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EXHIBIT O.

CONSTRUCTION ACCOUNT No. 5.

BELT RAILROAD.

Statement of Cost of Construction and Maintenance.

Fiscal Year Ending—	Construction and Equipment.	Maintenance.		Freight Sheds, Coal Platforms, Paving, etc.	Car Ferry Slips at Section 4, Seawall.	Total.
		Employés.	Fuel, Repairs, etc.			
June 30, 1891	$327 61					$327 61
June 30, 1892	74,188 90	$4,769 31	$2,349 25	$24,150 37	$46,503 31	151,961 14
June 30, 1893	4,496 68	8,071 05	3,070 57	72 10		15,710 40
June 30, 1894	50 69	9,621 00	4,971 94	222 70	16,183 12	31,049 45
June 30, 1895	11,587 38	8,857 95	3,434 31	6,875 62	7,791 88	38,547 14
June 30, 1896		10,234 05	4,954 96			15,189 01
June 30, 1897		8,507 75	2,914 82			11,422 57
June 30, 1898		9,553 75	5,515 38	3,389 50		18,458 63
	$90,651 26	$59,614 86	$27,211 23	$34,710 29	$70,478 31	$282,665 95

Revenue.

Fiscal Year Ending—	Sale of Rails and Trimmings.	Switchin Cars.	Freight Sheds and Car Ferry Slips.	Tolls.	Total.
June 30, 1892		$4,580 75	$8,406 43	$4,493 17	$17,480 35
June 30, 1893		12,039 00	21,600 00	10,019 51	43,658 51
June 30, 1894		10,775 25	21,600 00	8,185 68	40,560 93
June 30, 1895		10,118 75	21,600 00	8,972 13	40,690 88
June 30, 1896	$5,934 25	11,730 00	23,100 00	8,060 69	48,824 94
June 30, 1897		11,619 25	23,400 00	10,007 05	45,026 30
June 30, 1898		13,313 50	23,400 00	11,244 70	47,958 20
	$5,934 25	$74,176 50	$143,106 43	$60,982 93	$284,200 11

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EXHIBIT P.

CONSTRUCTION ACCOUNT No. 6.

UNION DEPOT AND FERRY HOUSE.

Masonry work, Union Depot and Ferry House. Date of contract, January 23, 1896. C. F. McCarthy, contractor.

Contract price			$230,000 00
Additions to contract—			
Sept. 19, 1896	$2,416 00		
Jan. 26, 1897	1,492 00		
June 29, 1897	836 15		
Dec. 21, 1897	2,385 00		
Feb. 4, 1898	487 38		
		$7,616 53	
Deductions—			
May 13, 1897	$3,840 00		
Mar. 5, 1898	226 62		
		4,066 62	
			$3,549 91
			$233,549 91
Dec. 18, 1896—Paid		$4,641 00	
Feb. 3, 1897—Paid		2,641 00	
Mar. 3, 1897—Paid		11,171 44	
Apr. 1, 1897—Paid		9,315 00	
Apr. 29, 1897—Paid		11,540 25	
May 27, 1897—Paid		19,290 30	
June 29, 1897—Paid		13,475 25	
July 27, 1897—Paid		17,330 25	
Sept. 13, 1897—Paid		13,717 50	
Oct. 6, 1897—Paid		9,681 00	
Nov. 3, 1897—Paid		8,516 53	
Nov. 30, 1897—Paid		15,591 75	
Dec. 29, 1897—Paid		15,808 50	
Feb. 4, 1898—Paid		10,700 14	
Feb. 19, 1898—Paid		487 38	
Feb. 26, 1898—Paid		7,185 75	
Apr. 13, 1898—Paid		5,973 53	
June 4, 1898—Paid		53,983 34	
June 4, 1898—Paid		2,500 00	
			$233,549 91

Cement, Union Depot and Ferry House. Date of contract, December 29, 1896. J. D. Spreckels & Bros. Co., contractors.

Contract price: $2 35 per bbl.		
Amount used: 5,230 bbls., at $2 35 per bbl.		$12,290 50
Mar. 26, 1897—Paid	$129 25	
Apr. 22, 1897—Paid	646 25	
May 13, 1897—Paid	1,880 00	
June 28, 1897—Paid	3,055 00	
July 15, 1897—Paid	3,055 00	
Aug. 11, 1897—Paid	2,232 50	
Sept. 14, 1897—Paid	117 50	
Nov. 11, 1897—Paid	235 00	
Nov. 11, 1897—Paid	705 00	
Jan. 5, 1898—Paid	235 00	
		$12,290 50

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Carpentering, plastering, and glazing, Union Depot and Ferry House. Date of contract, January 23, 1896. Bateman Bros., contractors.

Contract price			$48,400 00
Additions to contract—			
Jan. 14, 1897	$2,994 00		
May 13, 1897	2,995 00		
Sept. 21, 1897	551 25		
Jan. 4, 1898	2,230 45		
Jan. 17, 1898	345 00		
		$9,115 70	
Deductions from contract—			
Nov. 24, 1897	$175 00		
June 2, 1898	50 00		
June 2, 1898	140 00		
		365 00	
			$8,750 70
			$57,150 70
Paid prior to June 30, 1896		$33 00	
July 9, 1896—Paid		1,060 50	
Aug. 11, 1896—Paid		5,115 00	
Jan. 12, 1897—Paid		972 00	
Mar. 16, 1897—Paid		1,125 72	
Apr. 22, 1897—Paid		1,404 84	
June 24, 1897—Paid		2,094 32	
Aug. 11, 1897—Paid		2,247 57	
Sept. 10, 1897—Paid		1,965 00	
Oct. 18, 1897—Paid		6,026 25	
Nov. 3, 1897—Paid		4,361 25	
Dec. 2, 1897—Paid		11,040 25	
Jan. 4, 1898—Paid		2,700 00	
Jan. 12, 1898—Paid		2,230 45	
Feb. 12, 1898—Paid		1,012 50	
Feb. 26, 1898—Paid		345 00	
Mar. 12, 1898—Paid		990 00	
June 8, 1898—Paid		418 30	
June 27, 1898—Paid		12,008 75	
			$57,150 70

Rolling wooden shutters, Union Depot and Ferry House, first floor. Date of contract, August 24, 1897. Edward B. Hindes, contractor.

Contract price		$2,960 00
Oct. 6, 1897—Paid	$1,039 50	
Nov. 13, 1897—Paid	846 00	
Jan. 12, 1898—Paid	334 50	
Feb. 23, 1898—Paid	740 00	
		$2,960 00

Rolling wooden shutters, Union Depot and Ferry House, second floor. Date of contract, August 24, 1897. Edward B. Hindes, contractor.

Contract price		$2,615 00
Oct. 6, 1897—Paid	$835 50	
Nov. 13, 1897—Paid	922 50	
Jan. 12, 1898—Paid	203 25	
Feb. 23, 1898—Paid	653 75	
		$2,615 00

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Constructional iron and steel work, Union Depot and Ferry House. Date of contract, March 20, 1896. Risdon Iron and Locomotive Works, contractors.

Contract price			$188,000 00
Additions to contract—			
Oct. 29, 1896	$1,550 00		
Oct. 30, 1896	1,449 00		
Nov. 5, 1896	824 00		
Nov. 5, 1896	461 30		
Feb. 4, 1897	600 00		
Feb. 26, 1897	600 00		
Feb. 26, 1897	400 00		
Sept. 14, 1897	975 00		
Dec. 2, 1897	2,970 00		
		$9,829 30	
Deductions from contract—			
Aug. 7, 1897	$4,000 00		
Aug. 24, 1897	200 00		
		4,200 00	
			$5,629 30
			$193,629 30
Paid prior to June, 1896		$9,564 44	
July 2, 1896—Paid		2,982 90	
Aug. 4, 1896—Paid		55,745 23	
Sept. 3, 1896—Paid		12,180 14	
Oct. 1, 1896—Paid		14,676 42	
Nov. 5, 1896—Paid		21,048 62	
Dec. 3, 1896—Paid		16,975 42	
Dec. 8, 1896—Paid		729 30	
Dec. 17, 1896—Paid		1,550 00	
Jan. 5, 1897—Paid		1,449 00	
Feb. 4, 1897—Paid		600 00	
April 1, 1897—Paid		716 85	
June 2, 1897—Paid		539 15	
June 25, 1897—Paid		300 00	
Nov. 3, 1897—Paid		4,575 00	
Dec. 2, 1897—Paid		1,076 83	
Dec. 3, 1897—Paid		2,970 00	
Jan. 10, 1898—Paid		45,950 00	
			$193,629 30

Heating, Union Depot and Ferry House. Date of contract, April 15, 1897. W. W. Montague & Co., contractors.

Contract price	$5,675 00	
Addition to contract	335 00	
		$6,010 00
July 28, 1897—Paid	$2,428 53	
Dec. 30, 1897—Paid	1,320 00	
May 19, 1898—Paid	842 72	
		$4,591 25
Balance due		1,418 75
		$6,010 00

Vault necking, and door. Date of contract, November 24, 1897. Herrin-Hall-Marvin Co., contractors.

Contract price	$200 00
April 2, 1898—Paid	200 00

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Plumbing and gasfitting, Union Depot and Ferry House. Date of contract, January 23, 1896. E. James Duffey, contractor.

Contract price			$11,123 00
Additions to contract—			
Jan. 12, 1897	$2,063 00		
Jan. 14, 1897	715 00		
Feb. 2, 1897	475 00		
Feb. 18, 1897	700 00		
		$3,953 00	
Deduction from contract—May 13, 1897		550 00	
			$3,403 00
			$14,526 00
Feb. 3, 1897—Paid		$5,067 80	
Mar. 4, 1897—Paid		2,747 79	
Apr. 8, 1897—Paid		2,466 03	
May 11, 1897—Paid		847 65	
May 28, 1897—Paid		337 50	
			$11,466 77
Balance due			3,059 23
			$14,526 00

Roofing, skylights, and galvanized iron work, Union Depot and Ferry House. Date of contract, January 28, 1896. William Cronan, contractor.

Contract price			$43,599 00
Additions to contract—			
Dec. 10, 1896	$2,875 00		
Aug. 24, 1897	1,392 00		
Oct. 26, 1897	2,978 00		
Mar. 4, 1898	2,956 00		
		$10,201 00	
Deductions from contract—Jan. 12, 1898		345 00	
			$9,856 00
			$53,455 00
June 17, 1897—Paid		$2,087 35	
June 30, 1897—Paid		6,644 61	
July 28, 1897—Paid		6,426 03	
Sept. 10, 1897—Paid		9,064 71	
Oct. 6, 1897—Paid		4,617 50	
Nov. 3, 1897—Paid		5,520 00	
Dec. 1, 1897—Paid		2,875 00	
Feb. 4, 1898—Paid		1,425 00	
Mar. 5, 1898—Paid		2,956 00	
June 29, 1898—Paid		1,025 30	
			$42,641 50
Balance due			10,813 50
			$53,455 00

Steel folding or collapsing gates, Union Depot and Ferry House. Date of contract, August 17, 1897. California Artistic Metal and Wire Co., contractors.

Contract price		$2,436 00
Jan. 18, 1898—Paid	$1,827 00	
Mar. 4, 1898—Paid	609 00	
		$2,436 00

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Painting Union Depot and Ferry House. Date of contract, January 23, 1896. George J. Smith & Sons, contractors.

Contract price	$12,900 00	
Deduction from contract—December 21, 1897	313 85	
		$12,586 15
Sept. 10, 1897—Paid	$1,551 04	
Nov. 11, 1897—Paid	1,211 25	
Dec. 1, 1897—Paid	2,163 75	
Dec. 30, 1897—Paid	1,683 75	
Jan. 28, 1898—Paid	862 50	
Mar. 18, 1898—Paid	1,200 00	
		$8,672 29
Balance due		3,913 86
		$12,586 15

RECAPITULATION.

Contractors.	Amount of Contract.	Amount Paid.	Amount Due.
C. F. McCarthy	$233,549 91	$233,549 91	
J. D. Spreckels & Bros. Co.	12,290 50	12,290 50	
Bateman Bros.	57,150 70	57,150 70	
Edward B. Hindes	5,575 00	5,575 00	
Risdon Iron and Locomotive Works	193,629 30	193,629 30	
California Artistic Metal and Wire Co.	2,436 00	2,436 00	
Herrin-Hall-Marvin Co.	200 00	200 00	
E. James Duffey	14,526 00	11,466 77	3,059 23
William Cronan	53,455 00	42,641 50	10,813 50
W. W. Montague & Co.	6,010 00	4,591 25	1,418 75
George J. Smith & Sons	12,586 15	8,672 29	3,913 86
Edward R. Swain	14,095 01	14,095 01	
Totals	$605,503 57	$586,298 23	$19,205 34

Amount in San Francisco Depot Fund	$600,000 00	
Premium on sale of bonds	7,125 00	
Total		$607,125 00
Total amount of contracts		605,503 57
Balance		$1,621 43
Balance in fund June 30, 1898		$20,826 77
Balance due on contracts:		
E. James Duffey	$3,059 23	
William Cronan	10,813 50	
W. W. Montague & Co.	1,418 75	
George J. Smith & Sons	3,913 86	
		19,205 34
Balance in fund		$1,621 43

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EXHIBIT Q.

STATEMENT OF COST OF DREDGING.

Fiscal Year Ending—	Salaries of Employés.	Repairs.	Coal.	Ship Chandlery and Water.	Miscellaneous, including Docking Dredgers, Tugs, and Scows.	Total.	No. Yards Dredged.	No. Hours Worked.	Cost per Cubic Yard, Cents.
June 30, 1875	$11,663 97	$10,362 99	$8,639 00	$1,386 64	$1,301 25	$33,835 71	303,429	2,348¾	10.76
June 30, 1876	11,932 98	7,639 43	8,224 04	1,660 85	1,905 74	31,363 19	342,638	2,634	9.15
June 30, 1877	11,980 99	4,041 44	5,971 71	1,582 10	1,676 79	25,253 03	280,197	2,478½	9.01
June 30, 1878	17,188 80	7,372 48	7,754 86	2,666 37	3,032 55	38,214 40	423,654	3,080	9.02
June 30, 1879	26,201 70	14,963 90	11,755 12	5,443 70	1,289 60	60,454 68	843,879	4,694	7.16
June 30, 1880	27,202 59	8,824 19	11,115 11	4,184 65	318 75	51,645 29	749,011	4,323	6.89
June 30, 1881	25,948 49	10,196 63	11,037 15	4,194 44	85 81	51,462 52	732,919	3,962½	7.02
June 30, 1882	25,860 00	9,556 57	8,925 33	4,101 10	300 45	48,743 45	639,570	3,639½	7.62
June 30, 1883	25,860 01	12,152 06	9,093 05	3,800 58	551 80	51,457 50	635,322	3,776½	8.13
June 30, 1884	26,358 00	20,906 35	9,838 60	3,627 45	50 00	60,780 40	643,100	3,663½	9.45
June 30, 1885	26,896 24	11,610 58	10,074 34	3,657 64	20 00	52,258 80	680,700	3,652½	7.68
June 30, 1886	26,634 65	6,293 18	9,886 55	3,841 02	20 00	46,675 40	678,900	3,758½	6.87
June 30, 1887	26,520 00	36,872 40	7,911 49	4,435 62	2,307 48	78,046 99	601,800	3,175½	12.97
June 30, 1888	27,787 00	10,264 87	11,339 27	4,154 26	537 30	54,082 70	717,600	3,797½	7.52
June 30, 1889	27,847 00	21,004 76	9,392 65	3,292 77	887 78	62,424 96	536,800	3,010	11.62
June 30, 1890	27,825 87	10,403 04	9,377 93	3,671 54	310 53	51,588 91	645,300	3,298	7.99
June 30, 1891	28,112 45	8,919 66	10,163 75	3,735 55	2,299 40	53,230 81	569,300	3,206½	9.35
June 30, 1892	28,151 00	14,121 49	9,545 08	3,736 01	528 12	56,081 70	522,400	3,568	10.73
June 30, 1893	27,655 72	12,858 62	8,596 79	3,533 20	1,362 00	54,006 33	641,400	3,127	8.44
June 30, 1894	28,350 30	17,505 81	8,931 46	3,099 10	471 00	58,357 67	677,200	3,743½	8.75
June 30, 1895	28,516 20	39,226 19	7,959 10	3,683 94	279 00	79,664 43	537,400	2,751	14.823
June 30, 1896	28,493 81	14,132 13	8,713 25	5,208 95	90 88	56,639 02	657,300	3,055	8.617
June 30, 1897	28,515 60	16,519 35	7,118 87	3,411 09	122 00	55,686 31	691,600	3,229	8.051
June 30, 1898	28,910 90	13,611 64	6,986 15	4,550 97	219 15	54,278 81	645,600	2,917	8.407

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EXHIBIT R.

STATEMENT OF FOREIGN AND DOMESTIC TONNAGE ENTERING THE GOLDEN GATE BY YEARS SINCE 1864.

	Foreign.	Domestic.	Total.
1864			750,295
1865			708,703
1866			750,169
1867			924,872
1868	451,367	655,458	1,106,825
1869	416,833	757,000	1,173,833
1870	376,064	691,824	1,067,888
1871	347,843	701,440	1,049,283
1872	498,374	749,345	1,247,719
1873	553,284	750,026	1,303,310
1874	690,114	867,208	1,557,322
1875	604,464	984,005	1,588,469
1876	721,466	1,073,228	1,794,694
1877	607,264	1,006,999	1,614,263
1878	715,843	966,088	1,681,931
1879	668,675	945,307	1,613,982
1880	727,155	935,253	1,662,408
1881	985,258	1,068,681	2,053,939
1882	1,006,083	1,177,095	2,183,178
1883	991,892	1,060,536	2,052,428
1884	963,720	886,247	1,849,967
1885	803,173	1,066,719	1,869,892
1886	796,651	1,053,899	1,850,550
1887	926,810	1,213,801	2,140,611
1888	1,081,160	1,416,578	2,497,738
1889	1,106,849	1,367,962	2,474,811
1890	991,822	1,306,199	2,298,021
1891	1,402,125	1,282,320	2,684,445
1892	1,148,402	1,307,348	2,455,750
1893	1,144,750	1,289,807	2,434,557
1894	1,142,398	1,205,601	2,347,999
1895	1,208,058	1,297,703	2,505,761
1896	1,298,949	1,325,595	2,624,544
1897	1,106,561	1,345,020	2,451,581
1898 (to June 30)	530,173	655,669	1,185,842
Total tons	26,013,580	32,409,961	61,557,580

Tonnage for the years 1864-65-66-67 not segregated.

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EXHIBIT S.

REPORT OF EXPERT ACCOUNTANT.

SAN FRANCISCO, August 5, 1898.

The Honorable Board of State Harbor Commissioners, San Francisco:

GENTLEMEN: With the examination of the quarter ending June 30, 1898, I have now completed the examination of books and accounts of the State Harbor Commissioners for the two years ending June 30, 1898.

I find that the accounts under the various heads stand as follows:

BANK AND CASH ACCOUNTS.

1898, June 30—Cash balance, as per cash book		$14,881 88
Represented by—		
Balance in hands of Crocker-Woolworth National Bank	$12,914 83	
Coin and checks in safe	1,967 05	
		$14,881 88

SAN FRANCISCO HARBOR IMPROVEMENT FUND.

Through the kindness of State Controller E. P. Colgan in furnishing me with the required information, I am enabled to reconcile his balance with that of the Harbor Commissioners.

1898, June 30—State Controller's balance	$37,811 32
Deduct drafts outstanding (Nos. 1033, 1036, 1037, and 1039 to 1048 inclusive), aggregating	18,272 29
	$19,539 03
Add remittance by Harbor Commissioners in settlement of business for month of June	16,843 57
	$36,382 60

This agrees with the balance as per Harbor Commissioners' ledger.

SAN FRANCISCO DEPOT FUND.

1896, June 30—Balance as per Harbor Commissioners' Ledger (*vide* last Biennial Report)	$597,527 56	
Less—		
1898, June 30—Drafts drawn against this fund July 1, 1896, to date	576,700 79	
		$20,826 77

I am also favored by State Controller E. P. Colgan with the

Balance of this fund, according to his books	$34,703 54	
Deduct drafts outstanding (Nos. 119, 123, and 124)	13,876 77	
		$20,826 77

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SAN FRANCISCO DEPOT SINKING FUND.

As the Harbor Commissioners' books merely give the monthly transfer of $4,631 from the San Francisco Harbor Improvement Fund to the Depot Sinking Fund, it is only through the courtesy of State Treasurer W. S. Green that a statement of this account is had, of which the following is a synopsis:

STATE TREASURER—*Dr.*

1896, July 1—To balance of cash on hand (*vide* last Biennial Report)		$22,990 65
1898, June 30—To monthly transfers from San Francisco Harbor Improvement Fund—		
24 months, at $4,631		111,144 00
Interest on $70,000 U. S. bonds, 4%, 24 months		5,600 00
Interest on $50,000 U. S. bonds, 4%, 24 months		4,000 00
Interest on $50,000 U. S. bonds, 4%, 6 months		1,000 00
		$144,734 65

Cr.

1897, Nov. 27—By investment in 4% U. S. bonds	$50,000 00	
By premium paid on U. S. 4% bonds	14,000 00	
By exchange and brokerage on U. S. 4% bonds	159 25	
By interest accrued on U. S. 4% bonds	49 73	
1898, June 30—By interest on $600,000 S. F. Depot bonds, 4%, 24 months, to December 31, 1897	48,000 00	
		112,209 00
Cash on hand		$32,525 65

Present condition of this account:

Cash balance	$32,525 65
Invested in United States 4% bonds	170,000 00
Total	$202,525 65

The errors found by me in the course of my quarterly examinations covering the two years ending June 30, 1898, being only clerical, few in number, and of a trivial nature not affecting the financial accounting, were corrected on discovery. I have, therefore, great pleasure in reporting everything correct.

All the financial statements contained in the present Biennial Report have also been carefully examined by me, verifying them by the Harbor Commissioners' books, with which they are in strict consonance.

REMARKS.

The present balance to the credit of the San Francisco Harbor Improvement Fund, $36,382.60, may appear small when compared with balance of former years, but it must be remembered that the San Francisco Depot Sinking Fund has been created by a monthly transfer of $4,631 from the former to the latter, in conformity with the Act of the Legislature, which for sixty-five months amounts to $301,015. This,

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added to the sum of $336,202.60 paid out of the same fund for the foundations of the new depot, would bring the present balance to the credit of the San Francisco Harbor Improvement Fund to the sum of $673,600.20—a greater sum than has heretofore been reached.

As to the payment of the $600,000 San Francisco Depot Bonds, the financial situation is highly satisfactory, having already enough in the sinking fund to cover over one third of the amount.

The general rule is that all large undertakings cost more than first estimates, and the new Ferry Depot is no exception; but the benefits to the general public must be considered fully commensurate with the outlay, and the imposing structure will ever stand as a fitting monument to the enterprise of California and the intelligence of the Commissioners and others concerned.

With regard to the Secretary's books and accounts, they merit a meed of well-earned praise, as they evince more than ordinary care and correctness.

I am, gentlemen, yours faithfully,

JULIAN B. HARRIES,
Accountant.

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EXHIBIT T.

REPORT OF CHIEF ENGINEER.

To the Honorable the Board of State Harbor Commissioners:

GENTLEMEN: Pursuant to a resolution passed by the Board on August 17, 1897, I visited the Atlantic ports of New York, Boston, and Philadelphia, for the purpose of investigating their methods of wharf construction and other improvements pertaining to waterfront matters.

I spent some eighteen days in New York, twelve days in Boston, and four in Philadelphia. During those periods I investigated the subjects of wharf and dock building generally, the methods of ferry-slip construction, the question of timber and pile preservation, and of seawall and harbor embankment construction. I also looked somewhat into the question of freight handling between ship and car (involving the matter of belt railroads), and in a general way the question of pavement as applied to the roadways of piers and approaches thereto.

After a general description of the waterfront of these three cities and their method of regulation, I propose to take up the above-mentioned subjects seriatim.

NEW YORK.

The ownership of the wharves and docks of New York is about evenly divided between the municipality and private parties, but the waterfront is controlled by a Department of Docks consisting of three commissioners. Said Department was established in 1870. Before that time there had been no systematic plan for the construction of wharves around the city, private owners building to suit their own convenience. Under the management of the Department, with the advice of their Chief Engineer, Mr. G. S. Greene, Jr., a systematic construction of piers and seawall is continuously going on.

In 1890, a bulkhead or seawall line was established by a Board of United States Engineers, around the entire island; all new work is made to conform to this line. The Department has already built some three miles of solid masonry wall in conformity thereto, which will be continued until the whole island is surrounded. All wharves constructed by private parties are now made to conform to the established waterfront line.

The Department at the present time is engaged in the reclamation of a portion of the waterfront on North River above West Eleventh Street.

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This section was filled in many years ago (by authority of the Legislature), but it has narrowed the river to such an extent that it makes it impossible to build piers of sufficient length to suit the demands of commerce in this portion of the city for nearly a mile.

The reclamation above spoken of consists in the removal of all obstructions to a depth of at least thirty feet of water. These obstructions consist of wharves, crib work, solid filling, and buildings from three to six stories in height. I saw at work in this locality ten dredgers and five pile-drivers. The area to be removed at present is about 700 feet wide and 2,000 feet long, and this reclamation, together with the new proposed piers and seawall, will cost not less than seven millions of dollars. It contemplates a marginal street at the head of the piers 250 feet in width for the accommodation and better handling of the immense traffic which centers at this location.

All new piers are built by the commissioners, and are leased for a term of years, but all sheds and upper works are planned and built by and at the cost of lessees to suit their needs; the plans, however, are approved by the Department of Docks.

The commissioners have just completed on the pier at the foot of East Twenty-fourth Street, a shed that is known as a recreation building; it is two stories in height and some 60 feet in width and 600 feet in length. The lower story, or wharf proper, is open, and is used as a landing place for general merchandise. The upper floor is devoted to the free use of the general public, and is partially closed by means of drop sides and ornamental railing; the entire floor (with the exception of a band stand, refreshment counter located in the center, and seats around the sides) is clear. The roof construction is of steel, having arched trusses, and is ornamental in design and finish. The interior, when lighted with electric lights, is very attractive, and on the warm nights of midsummer is crowded to its fullest extent with the poorer classes. The commissioners intend building two more of these structures in other locations on the waterfront.

All the repairs on the waterfront, all of the concrete blocks used in the construction of the seawall, and a large part of the construction are done directly by the employés of the commission. Some of the larger contracts, such as dredging, furnishing, and filling of material, are done by contract. There is in charge of this construction and repair department a chief engineer and forty assistant engineers; aggregating an annual payroll for this Department of $64,500. In addition to this there are employed some two hundred and seventy-five laborers and dock builders. The Department has a floating property, which consists of one 100-ton derrick, three 12-ton derricks, one 10-ton derrick, two tugboats, sixteen pile-driving scows, one steam launch, two

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naphtha launches, twenty scows for lumber and building material, and thirty-eight yawl boats.

I desire to say to this commission that I was treated both by the Harbor Board and their Chief Engineer, Mr. George S. Greene, Jr., with the greatest courtesy, and was given every facility for obtaining information and data. Mr. Greene accompanied me on the Department tugboat up both rivers and to the various construction departments, and furnished me with plans and specifications of all the larger work.

BOSTON.

Boston harbor consists, essentially, of an outer and inner harbor, each accessible from the sea by a distinct channel and united by a deep waterway. The inner harbor, or harbor proper, lies to the north and westward of Long Island. Four rivers discharge their waters into the basin of this harbor: the Charles, Mystic, and the Chelsea rivers from the north, and the Neponset from the south. The direct entrance from the sea is by Broad Sound. The harbor is subdivided into several minor harbors, and contains many islands which provide shelter from storm during anchorage. The range of tide varies from 9 to 12 feet. The area of water inside the harbor all west of a line extended from Point Allerton, Lovells and Deer islands, is forty-six square miles, thirteen of which have a depth of 18 feet at mean low water, and eight of the thirteen a depth of 24 feet and over. The shore frontage, without reference to its use or occupation, is some forty-four and five-eighths miles, divided as follows:

Below Bridges.

Waterfront of city proper	1⅝ miles.
Charleston, exclusive of Navy Yard	1⅞ miles.
Portion of Chelsea frontage	¾ mile.
East Boston, exclusive of unimproved flats	2⅝ miles.
South Boston to reserve channel	1¾ miles.
Total	7⅝ miles.

Above Bridges.

Chelsea Creek, from First Bridge to Sales Creek	3½ miles.
Mystic River, Chelsea Bridge to Medford line	6 miles.
South Channel	1 mile.
Chelsea River to United States Arsenal	14 miles.
Fort Point Channel to South Bay	4 miles.
Millers River	1 mile.
Neponset River, from Commercial Point to Milton's lower mills	7½ miles.
Total	37 miles.

Of the 49,370 feet of the actual wharf frontage below the bridges (not including the Navy Yard), 8,400 are owned by railroads, 30,970 by private individuals, land companies, and other corporations; 9,150 feet of the waterfront on the south side of the harbor east of Fort Point

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Channel and extending to the reserve channel, as yet partially, and in some cases not at all developed, is owned by the Commonwealth, and about 1,000 feet of frontage on the peninsula is owned by the Municipality.

Below the bridges there is an excess of two hundred wharves, all owned by railroad companies and private parties. However, all new structures and the replacing of old into the tidewaters are under the jurisdiction of the Board of Harbor and Land Commissioners. This board was created in 1879; it consists of three members, who are appointed by the Governor, with the advice and consent of the Council, to serve a term of three years, a new commissioner being appointed before the first day of July of each year. They have charge of all the land, flats, and rights in tidewater belonging to the Commonwealth. They have charge of the Connecticut River, having the same powers as regards to it as they have in relation to tidewater. All fresh-water ponds in the Commonwealth over ten acres in area are placed in their charge, with substantially the same power. They control the removal of material from all beaches or bars, in order to prevent removal in any case where they consider such removal is liable to interfere or injure navigability of the waters in the vicinity. It is also their duty to remove from tidewaters, wrecks which are obstructing navigation, an annual appropriation of $5,000 being made for that purpose.

They have the right to lease for purposes not injurious to navigation any parts of the land of the Commonwealth for periods not exceeding five years. They also have the right to sell, with the consent of the Governor, lands on the back bay at public auction, or by private sale, single lots not exceeding 100 feet frontage.

They can make contracts for the improvement, use, or other disposition of the lands at or near South Boston, known as Commonwealth Flats.

The board has the power to license any person to build or to extend a wharf, pier, dam, seawall, bridge, or other structure, or to fill land or flats, or to drive piles over the tidewater, upon such terms as they may prescribe, so long as it is within the established harbor line. The parties or corporation desiring such proposed structure must submit plans of same, and the board shall appoint a time for hearing all parties that may be in any way interested in the proposed structure.

The amount of tidewater displaced by any structure below high-water mark must be ascertained by the board, and they must require the parties causing such displacement to make compensation therefor by either excavating between high and low water some part of the harbor to such an extent as to create a basin for an equivalent amount of tidewater as the amount displaced, or by paying in lieu of such excavation a sum not exceeding 37 cents per cubic yard for the tidewater displaced;

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the reason for the same being the maintenance of the tidal area of the harbor.

The anchorage and placing of vessels are under the jurisdiction of the Police Department, the Harbormaster being a deputy of the Chief of Police and captain of the police boat.

On April 17, 1895, by authority of the Legislature, a State Board on Docks and Terminal Facilities (for the Port of Boston) was appointed by the Governor, by and with the consent of the Council, consisting of three persons, one being the chairman of the Board of Harbor and Land Commissioners. Their duties were to investigate the policy of public ownership and control of the docks and wharves. This board reported to the Senate and House of Representatives of the Commonwealth, in April, 1897. The summary of their report, which is the gist of their conclusions, is as follows:

"That a portion of the foreshore should forever be preserved in the ownership and control of the people for uses and purposes such as the need of changing conditions may, from time to time, require, but that it is neither necessary nor desirable that the entire foreshore of the harbor should be thus held; on the contrary, a diversified ownership is believed to be the healthiest, and, therefore, the acquisition of certain parcels within the limits of the City of Boston as hereinbefore described is recommended."

During the existence of this board (their duties having ceased upon the filing of their report) they held daily sessions, taking testimony and collecting data from all parts of the world. A committee visited personally seventeen of the principal seaports of Great Britain and the continent of Europe; conferences were held with United States consuls and leading merchants and officials of these ports; inspections were also made of the chief Atlantic seaports, and data were received from the port of San Francisco.

The Board of Harbor and Land Commissioners of Boston have undoubtedly one of the most valuable and extensive collections of data with regard to harbor and waterfront matters in existence.

During my sojourn in Boston, I was treated by the members of this commission, Mr. Woodward Emery and Mr. Clinton White, with the greatest courtesy; they furnished me with every facility, both by land and water, for obtaining data. I visited with them all the important localities of the harbor. Mr. Clinton White, who also acted as secretary for the Commission on Docks and Terminal Facilities, is a veritable encyclopedia on harbor matters. I desire, also, to thank Mr. Frederick N. Wales, the secretary of the commission, for all the valuable printed matter with regard to the same. Mr. Frank W. Hodgdon, Chief Engineer, not only furnished me with valuable plans and specifications, but put me in touch with the railroad and city officials of his city.

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I am indebted to Mr. John E. Cheney, Assistant City Engineer, for plans of the Boston ferry slips and aprons and valuable specifications on street-paving.

There has been quite an amount of improvement, such as filling and reclamation on the South Boston flats, done in the past few years under the direction of this commission, and they have recently contracted for a pier in this locality some 400 feet wide and 1,200 feet long.

Before leaving this subject, I wish to say a few words with regard to the south station of the Boston Terminal Company, which is in course of erection. The depot proper is 560 feet wide, having a clear central span of 228 feet 6 inches, and two side spans of 165 feet 9 inches each; is 600 feet long, and 83 feet from under side of roof truss to floor and 106 feet to apex of roof. This depot, when finished, will rest on a foundation of over 40,000 piles, 26,000 having already been driven. There will be 700 trains daily in and out of the same. The local and suburban trains will occupy the basement floor, the tracks being in the form of a loop, being continuous and thus avoiding switching. The first floor will be occupied entirely by through trains.

PHILADELPHIA.

The location of the port of Philadelphia is at the junction of the Delaware and Schuylkill rivers, 103 miles inland. There is an available waterfront on the two rivers for commercial purposes of about 33 miles. The wharves are all owned by corporations and private parties owning the land at the head of the same, but they are built under license and according to the specifications of a Board of Wardens, appointed under legislative action. The Wardens are nineteen in number; sixteen are elected by the City Councils, one by the Council of Chester, one by the Council of Bristol, and the Master Warden is appointed by the State. The Master Warden is the legal head of the board. These Port Wardens make all the rules governing the harbor as to anchorage, etc.; they license the pilots, make the rules governing them, and have entire charge of the system so far as their discipline is concerned in the exercise of their duties; they also regulate the dredging of the various slips between the wharves as to the time and extent of same, which dredging, however, is paid for by the parties owning the adjacent wharves.

The parties owning lots on the waterfront of sufficient frontage (or with the consent of the adjacent property owners) to leave a slip of 150 feet on either side of same, may, by license from the Port Wardens, build a wharf to the pier head line by conforming to the plans of said Wardens and the payment of the cost of advertising ($20) and an additional fee of $25.

There is also a Board of Harbor Commissioners, whose duties are

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principally advisory as to changes in the waterfront and pier head lines, and who report to the City Councils. In the question of condemnation of wharf property for the purposes of improvement, they act jointly with the Port Wardens. This board consists of six citizens selected by the Presidents of the Select and Common Councils, the Chief Engineer of the city, and a United States Army consulting engineer, detailed by the Secretary of the Navy.

The improvement of the waterfront is authorized by legislative action, and is done by the City of Philadelphia under the guidance of the Harbor Commissioners and Port Wardens. The improvement contemplates a bulkhead and pier head lines. Delaware Avenue, which runs along the head of the present docks, was widened to 150 feet with a view of filling in with solid material. The City Engineer is at present at work on plans for a solid masonry bulkhead along this avenue, similar in construction to those used in New York City. The plan proposed provides for wharves from 75 to 100 feet in width and from 550 to 700 feet in length. The city has recently appropriated $815,000 for these improvements. All of this remodeling comes under the Board of Port Wardens and the Board of Harbor Commissioners, and they have the power to give notices in writing to the owners of the property affected by any change in construction to conform by removal or reconstruction to such changes, and in case of the said party so notified failing to prosecute the work prescribed within six months, the city has the power to condemn and appropriate the property and riparian rights, and the same becomes vested in the city; the owner receiving compensation for the taking.

I am greatly indebted for much valuable information and many courtesies to Mr. W. R. Tucker, Master Warden of the port of Philadelphia; also to the Chief Engineer of the city, Mr. George S. Webster, who has furnished me with many valuable plans and specifications of intended improvements.

I have received, through the courtesy of Mr. William Hunter, the principal assistant to the Chief Engineer of the Reading Railroad, plans and specifications of a pier and ferry rack now in course of construction, known as Pier No. 8, Philadelphia.

I am indebted to Mr. W. H. Brown, Chief Engineer of the Pennsylvania Railroad, for plans of the Twenty-third Street terminal station in New York City, showing waiting-rooms and upper deck bridges for ferry-boats.

NEW YORK WHARVES.

In New York City, in wharves of the same area, they use about double the number of standard or bearing piles (with the exception of the four outer bents) as are used in those of San Francisco. These piles are

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driven 10 feet from center to center longitudinally, and about 5 feet transversely; the outer pile in each bent is cut off one foot below the grade of the balance, and is capped with a longitudinal sub-cap 12 inches square. The balance of the standard piles in each bent are cut off to conform with a crown of 4 inches in a 60-foot wharf, and are capped transversely with 12 x 12 inch timbers.

The piles, after being stayed into position, are mortised into caps having tenons 7½ inches wide longitudinally, with the caps 3½ inches thick and 3 inches long; the caps are also drift-bolted to each standard pile with a wrought iron bolt 1 inch square. (In San Francisco the caps are merely drift-bolted to each pile with a 1-inch round iron drift bolt.)

The joints in the caps in the New York wharves are made to come over the standard piles, and in place of being butted, as is done here, they are scarfed in what is known as a ship carpenter's splice.

The stringer system, or as they call it there, rangers, are of 12 x 12 inch timber, spaced 5 feet apart, or so as to come directly over each standard pile, the outside stringers being composed of two pieces. All joints are formed half way between the bents of piles, and are secured with fish plates of 6 x 12 inch timber, one on each side, fastened with screw bolts; these stringers are fastened to each cap with drift bolts of square iron.

The covering of the wharf is of two thicknesses of 4 inches each; the lower or upper deck plank is laid at right angles with the stringer system, the planks being from 8 to 10 inches in width, and are laid 2 inches apart; the openings, however, are filled with 2 x 2 inch timbers at the caps and at the crossing of the rangers or stringers. The top layer or sheathing is composed of 4 x 10 inch planking, which is laid close and diagonally with the line of the wharf, forming an angle of 45 degrees with its general line. The length of these planks is such that they break joints alternately on the rangers or deck planks.

The main bracing of the wharf is by means of piles driven at an angle of eight horizontal to twelve vertical, one on each side of wharf at each bent; they are butted against the lower side of double rangers or outside stringers and the longitudinal sub-cap, and are fastened to this latter and to the second standard pile, in each bent, at intersections with screw bolts. There is an additional bracing in each bent as follows: A tie beam of 5 x 10 inch timber is fastened to each pile at each bent transversely with the line of the wharf at low water; from the outer end of this tie beam there are "A" braces of 5 x 10 inch timber extending to, meeting, and butting together at the top of the cross cap at center of wharf. These "A" braces are also fastened to each pile at each intersection and to the caps with screw bolts.

The curb, or as it is called in New York, the backing block, is laid

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directly on the surface of the planking of the wharf, flush with the outside edge of wharf, and fastened to the planking and outside stringers with drift bolts.

In place of fender piles, the outside standard piles are utilized for fastening vertical fenders of 8 x 12 inch white oak timbers, extending from the sub-caps to the line of low water; there are also two lines of horizontal fenders of 8 x 12 inch white oak extending the entire length of the wharf (with the exception of the four outer bents); one of these is fastened to the before mentioned sub-caps, and the other to the backing block; between these vertical fenders there are placed intermediate fenders of the same material, but reaching merely between the two longitudinal fenders.

In place of mooring piles there is used a cast-iron mooring bit similar to the ones now used along the various sections of the seawall in San Francisco. Those in New York, however, are placed on top of the backing blocks, and fastened thereto and to the outside rangers; these bits are spaced about 50 feet apart.

The four outer bents of the wharves are spaced about 20 feet from center to center. They consist of a double row of piles, each row containing the same number of piles as are under the regular caps, or making this row of double the carrying capacity of those caps. Each double cap consists of four pieces of 12 x 12 inch timber, being equivalent to a single cap 24 inches square. These bents are additionally strengthened by being bolted together, chocked between piles, and braced; they are also sheeted to the line of mean low water with horizontal planking 5 inches thick.

The end piles in each of these bents and the sheathing are so arranged that they present a rounded edge to the current. This is covered for a distance of four feet with an armature of boiler steel $\frac{1}{2}$ inch in thickness and 6 feet in height, securely fastened to piles and sheathing.

The outer sheathing of the end bent of piles is covered with an additional vertical sheathing of plank 5 inches thick. The outer corners of wharves were rounded on a $2\frac{1}{2}$-foot radius, and have corner bands of steel $\frac{1}{2}$ inch thick, 10 feet long, and 5 feet wide; these corners are protected with four fender piles of white oak; the ends of the four outer bents are also protected with an oak fender pile in addition to the horizontal fenders before mentioned.

The wider spacing of the outer bent, the additional bracing, and armature plates are for protection against floating ice. The stringer system in these outer four bents varies from that in the balance of wharf to the extent that the rangers are doubled in number and thickness, and are chocked in a manner similar to the caps in this locality.

The standard of the New York wharves as to carrying capacity is about double that of the San Francisco wharves, their limit as to load

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allowed being 500 pounds to the square foot. The timber for superstructure used there is what is known as hard yellow pine. The standard piles are generally of spruce, and vary from 50 to 80 feet in length. The wharf timbers rarely exceed 30 feet in length.

Any wharf on which it is contemplated building a shed or other structure is provided with an additional system of piling and stringers for the foundation of same. Some of the larger piers are what is known as double-deck, *i. e.*, they are covered with a two-story shed, the upper floor being used for the landing of merchandise or for passenger purposes. The columns supporting shed, the foundation stringers, and the floor system of upper deck, together with the frame work of the shed, are all of structural steel. These sheds are designed and paid for by the parties leasing the piers, the Department of Docks merely passing on the plans.

BOSTON WHARVES.

There is a pier to be constructed by the Harbor and Land Commissioners on South Boston flats, which when completed will be 400 feet wide and 1,200 feet long. It consists of a central core of solid material 300 feet in width and 1,150 feet in length, inclosed by a retaining wall of rough granite, the slopes being protected by a platform wharf of piling around both sides and end. The method of building this wall (which is the same as the bulkhead or river wall) is as follows:

A trench 70 feet in width is first dredged around the entire exterior lines of the proposed pier, having a depth of 30 feet at mean low water at its outer line and 20 feet at its inner line; this depth of 20 feet being a bench 30 feet in width, measured outwardly from which line it slopes to meet the outer cut of 30 feet. In this trench, five rows of piles are driven, 2 feet from centers tranversely and 2 feet 6 inches longitudinally. They are capped with 6 x 12 inch spruce timbers, laid on their flat and tree-nailed to each pile. These caps are then covered with spruce planking 3 inches thick, forming a platform 8 feet 6 inches wide. There is also a brace or spur shore pile battering outwards driven between each bent and also capped with a 6 x 12 timber; this pile is also secured to a girder of 6 x 12 running longitudinally with the platform and fastened to each standard pile at each intersection. Before the platform is placed on these piles (which are sawed off one foot below mean low water) the trench is filled with broken rock or cobbles to the level of the top of the piles. The surface of this embankment thus formed is covered on the sea slope with large rock of 1½ feet in thickness, laid on a slope of 1½ to 1, the inner slope being 2 to 1 and the width of the embankment on top is 8 feet 6 inches—the width of the platform.

On top of this wooden platform above described, is built a retaining wall of rough granite laid dry with headers and stretchers, the size of the stone being 2 feet thick, 3 to 4 feet in width, and from 4 to 6 feet in

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length. The top or coping stone are roughly dimensioned and cover the entire width of the wall at the top. The wall is 8 feet wide at the bottom, battering inwards from the sea to 4 feet 6 inches at top, and having a height of 14 feet. The top of the wall is 14 feet above mean low water, and its outer edges are 50 feet in-board from the exterior line of the pier. As a protection to the inner surface, a wall of loose rock is laid against the same. The entire area inclosed is then filled up to the grade of the top of the wall with dredged material taken from the harbor. Around both sides and ends of this wall there is then built a wharf or platform (similar to that on the outer side of the seawall and thoroughfare here in San Francisco). It is 50 feet in width, and is supported on eight rows of piles driven about 6 feet apart transversely and 8 feet longitudinally. These are capped with timbers of 14 x 14 fastened to each pile. The wharf is braced with two rows of spur-shores longitudinally, battering outwards, or the reverse of the usual way. The first, which is located at the first row of standard piles from the inner side, is notched out and fastened to that pile at a point half way between high and low water. The other is located at the middle standard pile, and is fastened thereto at the line of high water. The stringer system of this wharf consists of a main stringer on either side 12 x 12, the intermediates being 6 x 12 placed 2 feet from centers. They are all drift-bolted to caps.

The fender piles are capped with a 14 x 14 timber, which extends above the planking about 6 inches, thus acting both as chocks and as a backing log; the fender piles are also fastened to the adjacent standard piles.

The wharf is additionally braced with two girder planks at each bent: one is set level and just above the line of low water; the other is on an angle battering inwards, and extends from the outside standard pile at the line of the bottom of the caps and reaches to the bottom girder at the inner line of the wharf. They are both fastened to each standard pile at each intersection with screw bolts. The entire surface of the wharf is covered with 3-inch planking. Most of the piles used are of oak. The wharf, or wooden portion of this pier, would have a safe carrying capacity of at least 600 pounds to the square foot, while that of the core is unlimited.

Wooden Wharves.—The ordinary wooden wharves of Boston are constructed as follows:

Standard piles, generally of oak, are driven 9 feet transversely and 10 feet longitudinally. They are bound together on top with two girder caps of 6 x 10 inch hard pine, and fastened to piles with 1-inch screw bolts; the girder caps are let into the piles, so that the same are spaced 3 inches apart. The outside stringers are of 10 x 12 inch and all inside stringers of 6 x 12 inch hard pine, spaced 2 feet from center to center.

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The wharves are covered with 3-inch hard pine planks. The wharves are braced by brace piles, called there spur-shores; they are of oak, and are shouldered against the outer standard pile at about 1 foot below mean high water, and fastened thereto with 1¼-inch screw bolts. In addition to bracing with piles, each bent has a set of crossbraces of 4 x 8 inch oak, running from a point about 2 feet above mean low water to the under side of the girder caps. These braces are fastened to each standard pile at each intersection with 1-inch screw bolts; a horizontal tie of 4 x 8 inch oak is also placed 1 foot above mean low water and fastened to each pile in each bent with 1-inch screw bolts.

Fender piles of oak are driven in transverse lines, with standard piles close up against the outer ones, and fastened thereto just below the girder cap with 1¼-inch screw bolts. The fender piles are cut off 9 inches below the top of the planking, and are capped with 12 x 12 inch hard pine caps running longitudinally. These caps answer as longitudinal fenders, and projecting 3 inches above the planking also as a curb or backing block.

Mooring piles of oak are driven just inside of outer stringers, and are held in place by 4-inch planks fitted down into adjoining stringers and around mooring piles.

The corners of these wharves are similarly piled and finished as are the wharves of Philadelphia and New York.

A safe load for these wharves would be about 300 pounds per square foot.

PHILADELPHIA WHARVES.

These wharves, with the exception of two outer bents, are constructed as follows:

Standard piles are, as prescribed by the rules of the Board of Port Wardens, driven in bents located longitudinally, 10 feet from center to center. The piles in these bents are 5 feet apart from centers transversely, and before being cut off at the proper level, they are straightened and stay-lathed into position. They are then bound together transversely with girder plank of 6 x 12 inch, gained into piles, equally on each side, leaving a tenon of 4 inches thick, 12 inches long, and the width being the full diameter of the pile. They are fastened to each pile with two screw bolts. The cap proper is a single piece of 8 x 16 inches laid on its flat, covering the pile and being flush on each edge with the girders; they are drift-bolted to the piles and well spiked to the girder planks, or clamps, as they are called.

The wharf is braced in the following manner: At the line of mean low water two girders of 5 x 10 inches are fastened to each pile in each bent, one on either side of the pile; the spaces between these planks and the four outer piles on each side are chocked with 12 x 12 inch timbers securely bolted to the girder plank. The bents are then diagonally

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braced with "A" braces of 5 x 10 on each side, making four in number, dividing the said bent into two panels; *i. e.*, a set of braces extend from the girder either way from the center of the wharf to a point at under side of deck line, distant from the outside of wharf one-fourth of its entire width. From the outside of wharf, at this same lower girder, another set extends to the bottom deck, and, meeting the first set, they are bolted to each pile at each intersection with galvanized screw bolts.

The stringer system is composed of an outside stringer of 12 x 14 inches and intermediates of 6 x 14 inches laid 2 feet 6 inches from centers. They are dapped or gained out at caps 1 inch. The floor is composed of two layers of 3-inch plank, dressed to a uniform thickness; the first is laid at right angles to the axis of the wharf, and the planks are placed 6 inches apart, these spaces over the stringers being filled solid for the full width of the same. The planks in the outer section of this layer, about 12 feet in length, are creosoted with 14 pounds of dead oil to the cubic foot; they are fastened to the stringers with wrought spikes ½ inch square and 7 inches long.

The sheathing plank or upper layer are laid close and at an angle of 45 degrees with the axis of the wharf, and are spiked to the lower plank with 5-inch wire nails averaging 3 feet apart.

The backing log or curb is a 10 x 12 inch white oak timber, raised above the planking of the wharf and supported on blocking of 2 x 12 inches laid 5 feet apart.

Fender and brace piles are used only on the outer bents. The usual system of fenders is a series of 6 x 8 inch white oak timbers placed horizontally around the wharf between the top and the line of mean low water. They are placed about 6 inches apart, and are fastened to vertical furring pieces of 8 x 12 inch yellow pine, which are bolted to the front row of standard piles in each bent, these piles being surfaced off to receive them.

The two outer bents are constructed as to spacing, protection, number of piles and braces as are the New York wharves. They have rounded corners, white oak fender piles, and in addition, fender piles at the ends of these two outer bents; they have also brace piles and corner bands and chocks connecting fender piles.

In addition to the regular standard piles, clusters of four piles each are driven on both sides of the wharf at intervals of 20 feet. They are capped with a solid platform of 12-inch timbers bolted together about 4 feet square, having a covering of 3-inch plank and braced with two incline piles, the whole being tied to adjacent standard piles with girts of 8 x 10 inches. From this platform so built, there is carried a hollow column of structural steel, composed of two 15-inch channel beams placed 6 inches apart and connected with steel diaphragms on either side. These columns extend upward to the under surface of the plank-

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ing, and are there again tied to the standard piles with girts of 5 x 12 inch timbers. The hollow portion of the column is then filled solid with concrete. The object of these columns is to serve as a foundation for the posts of a contemplated shed.

Mooring bits are used in the Philadelphia wharves in place of mooring piles. They are placed about 50 feet apart on either side of the wharf, and are fastened to special foundation timbers.

On wharves that are designed for the use of vessels having lower ports for loading, they have what they call drop gangways. They vary from 12 to 14 feet in width and are about 24 feet long. In these gangways they use an apron or bridge which can be raised or lowered to suit the varying heights of the tide.

The method adopted is to counterweight this bridge or apron; and, for moving the same, use what is known as a worm gear hoist, which consists of a right and left hand worm engaging with gear wheels to which a chain wheel is attached, the whole being almost a counterpart of the device used here on the various aprons at the ferry slips before the hydraulic system was adopted.

There is a wharf in course of construction in Philadelphia for the Reading Railroad Company, known as Pier 8, which differs somewhat from the one above described, inasmuch as the outer standard piles are sub-capped with side caps of 12 x 12 timber, mortised and tenoned, and the outside stringers compounded, consisting of two pieces of 12 x 14. The posts of the proposed shed have no independent piling, but rest on a special floor beam. The wharf is braced additionally to the above described sway braces with a brace or batter pile at each bent on each side of the wharf, and the caps proper are of 12 x 12, in addition to the girders and clamps. In this wharf all piles and timbers are creosoted with 10 pounds of dead oil to the cubic foot.

The Philadelphia wharves have a capacity of at least 700 pounds to the square foot, with a factor of safety of three.

After looking into the various methods of wharf constructions of the cities of New York, Boston, and Philadelphia, the question arises, in what respect do they vary from those of San Francisco and what improvement could be made in our wharves?

WHARVES OF SAN FRANCISCO.

From the foregoing description of piled wharves in Boston, New York, and Philadelphia harbors, it is readily seen that they are constructed to carry a much greater load than are ours. The Eastern wharves are designed for loads varying from 400 to 600 pounds per square foot, with a factor of safety of four; whereas, the maximum loads for our wharves are 250 pounds per square foot, with the same factor of safety; but this factor decreases very quickly and materially, as piles in some localities

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of this bay are attacked by the wood-destroying pests soon after construction.

Comparing the construction of Eastern wharves with those of San Francisco, I venture to say that, leaving aside those parts in the Eastern wharves which are designed to resist the floating ice, the details of construction of our wharves are simpler; having no gains or tenons they are not so apt to suffer from dry rot; the fact of having but few joints in caps and stringers they are, consequently, in this respect superior to the Eastern structures. This construction of our wharves is, however, greatly owing to the better materials at our disposal, and for which the Coast is famous.

The length of timbers for wharf construction in the East very rarely exceeds 40 feet, but generally timbers up to 30 feet in length only, are specified and used. In our wharves timbers of from 60 to 100 feet and over in length have frequently been employed, and are to be had with only a very small additional cost. With piles it is the same in Eastern wharf construction; a pile 60 feet long is considered a very long pile, whereas on this Coast piles from 100 to 130 feet in length can be had at any time.

The carrying capacity of our wharves may have been sufficient in past years, but with the increase of commerce and a required quicker loading and discharging of vessels, especially steamers, which latter must sometimes be dispatched in a very short time, and loads intended for shipping must be partially stored on the wharves while the boats are still discharging, the carrying capacity of the wharves should be brought up to those of Eastern structures. To do this, standard piles should be driven not more than 6 feet transversely, and not more than 8 feet longitudinally; the caps and stringers could remain about the same as in present wharves. All piles should be either protected by coating or creosoted to prevent the attack of the teredo and the limnoria, as these pests are more numerous and far more destructive to wooden structures in our waters than they are in the Eastern harbors above mentioned. As to preserving piles and timbers for wharf construction, I shall treat this subject more fully later on in this report.

No wharf or structure in this bay designed for durability should rest on unprotected or unpreserved piling; but the most effective way of checking the destruction of marine insects is by placing such structure on cylinder piers, as used under piers Nos. 7 and 13, or on iron cylinders or columns, where less depth of water and mud and a hard bottom are found.

Such structures, designed for a carrying capacity of 500 pounds per square foot, would not only insure perfect safety at all times, but also the greatest durability and consequently minimum cost for repairs.

Admitting that the original cost of such structures is 40 per cent

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in excess of the amount of wooden ones, the constant repairing required on the latter, and the loss of revenue during the progress of such repairs, would soon make up the difference in the original cost.

The solid piers, as constructed in Boston Harbor under the jurisdiction of the Board of Harbor and Land Commissioners, and described in this report, would, after the completion of our seawall to about the foot of Channel Street, become very applicable and perhaps necessary to our harbor front, and I suggest, even at this early period, that at least two such structures ought to be constructed at some future time. It is not necessary to adopt the Eastern construction of these piers, nor will I advance a plan and details for the same to be built here, but as to the locality of same, there should be constructed one to the north at about the foot of Bay Street, and the other one south at about the foot of Brannan or Bryant Street. The dimensions of same should not be less than about 800 feet in length (projecting 200 feet beyond the pier head line), and from 300 to 400 feet in width. Such piers would be of very essential advantage to our front for the following reasons:

First—They would create breakwaters, and in time of stormy weather the one located to the north against northerly storms and the one to the south against southerly ones, thereby giving protection to the wharves and ships lying between same. An objection may be raised against such structures, inasmuch as they would to a certain extent shut off the current along the waterfront, and thereby create eddies, which would tend to cause the solid materials carried in suspension in the water to settle and lessen the depth of the water between wharves. This, however, in my opinion is not liable to occur any more than at present. Each wharf, ferry slip, and ship lying alongside of a wharf, and projecting at right angles against the current, as is the case in our system, produces eddies, and consequently permits the suspended materials to settle and deposit in the slips between wharves. Constant dredging, as is done at present between slips, will be required, whether these piers are constructed or not.

Second—Such structures would also serve as an outlet for the main sewage of this city, which could be carried in sewers built of any requisite size to deep water and discharged directly into the current of the bay, thereby doing away with the present system by which the sewers discharge their polluted waters along the waterfront, distributing obnoxious materials all along the seawall and generating unhealthy gases. It has been very thoroughly shown that sewers intended for discharging sewage matter off shore, and which were suspended from the superstructure of wharves, have been failures, whether constructed of iron or of wood; in both cases the sewers were limited in size, and in the first, the salt water corroded the iron in a very short time, and in the latter, the marine pests attacked and destroyed the wood in a still

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shorter time. In addition to these faults, sewers constructed of either iron or wood are exposed to the waves and strong currents, causing a constant working and racking, which is detrimental to both the sewer and the wharf from which it is suspended.

Third—Another advantage which would be gained from these structures, would be the bringing together of ship and car—a desire so much cherished by our mercantile community. Under our present system of wharves this is hardly practicable, as they are too narrow to allow a proper curve connection with the Belt Railroad, and also to accommodate, at the same time, vehicles, cars, and stored merchandise. These wharves could therefore be especially assigned to ships which bring or take goods in transit.

FERRY SLIPS.

The ferry slips and aprons in use in New York, Boston, and Philadelphia are all of similar construction, differing but slightly in detail. The connected lines of piles forming the slip proper (known as spring piles here, and called ferry racks in the East) are much lighter in detail of construction and less symmetrical in appearance in the Eastern cities than they are here in San Francisco.

However, most of the Eastern ferry-boats are much smaller than those in use here, and they have less tide to contend with in entering the slips; also, the lumber and piles obtainable here are much better adapted for this purpose than is the Eastern material.

All of the aprons or bridges leading to the lower decks of the Eastern ferry-boats are supported at their outer ends on pontoons allowing them to rise and fall with the tide. This necessitates a uniform height of all ferry-boats using the same slips.

The ends of these bridges or aprons are hollowed to fit the rounded nose of the boat, which is moored directly to the apron on either side.

In the case of the aprons here, as you are aware, the boat has no connection with the same, except by means of an auxiliary apron or bib, which reaches from the deck of the boat to the apron proper, the main apron being raised and lowered by hydraulic cylinders to accommodate any height of boat at any stage of the tide. In the case of Eastern aprons, any difference in the height of the boats or aprons which is liable, and does happen, from the leakage of either the boats or pontoons supporting the bridges, or the waterlogging of either from age, must necessarily make a step down or up from either, this being as variable as are the boats.

I will venture to say that if such were the conditions at the foot of Market Street, it would not be difficult to find many suburbanites ready to trip over the aforesaid step, with scores of contingent fee attorneys willing to bring a civil action for damages against the members of the Board and its officers.

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In the mooring of the ferry-boats here, which is by means of movable hooks attached to the slip proper, it is unnecessary to bring the boat to an exact position, as there is a leeway on the small apron of from 18 inches to 2 feet. Whereas, in the East, it is imperative that the connection between the boats and the aprons should be close. The *modus operandi* is to draw the nose of the boat into the hollow of the apron by means of capstans or chain drums located on either side of the apron and worked by means of hand wheels similar to that used as a steering wheel on vessels. As this is necessarily slow, the passengers on a San Francisco ferry-boat are unloaded much more rapidly than they are from an Eastern ferry-boat. The aprons on some of the Boston passenger ferries have an auxiliary apron similar to our bib, which is there called a raising-board, and is considered quite an improvement.

UPPER DECK LANDINGS.

The ferry slips on both the New York and New Jersey sides of the Pennsylvania Railroad have second-story waiting-rooms and upper deck landings and aprons, and they differ from those in use here both as to size and location, the bridges narrowing to 5 feet in width where they enter the boat, while those at the New Depot and on the Oakland side are 13 feet wide. There are two in number located directly over the main aprons and are parallel to it. A gallery is extended from either side of the upper deck to receive them. These aprons are hung from the roof timbers of the shed covering them, and are raised and lowered to suit the tide by means of chains and drums worked by hand.

The upper deck bridges in the New Depot enter the upper deck of the boat at right angles to the boat on either side, and both the bridge proper and bib are worked by hydraulic cylinders.

There are two ferry-boats owned by the Pennsylvania Railroad and using the ferry slips above described, which are undoubtedly the finest in the United States; they are double end propellers, having twin screws on both ends. The omission of the walking beam necessary on side-wheel boats propelled by beam engines, gives room for large and elegant saloon decks; there is also a great advantage in the use of twin screws, as by reversing the motion of the different pairs, it is possible to turn these boats in their own length, thus insuring a good landing in a swift tide, either ebb or flood.

In my investigation of the ferry slips and boats of the Pennsylvania Railroad, I am indebted to Mr. E. F. Brooks, Superintendent of the New York division of this road, for his courtesy and much valuable data.

CAR FERRY SLIPS.

The car freight slips and aprons in use in the East are built and operated on the same principle as the passenger slips (that is, they are supported on pontoons), but they are much heavier in details of con-

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struction. The greater part of the cars are handled on barges similar to those used by the North Pacific Coast Railroad at Clay Street wharf before the construction of their present freight boat; they are known there as car floats, and transported from slip to slip by means of tug-boats. There are, however, two aprons belonging to the Pennsylvania Railroad Company at Jersey City which have modifications of the pontoon system of raising and lowering. My attention was called to these by the Division Superintendent as an improvement on the regular method. The apron is divided transversely into two sections, the inner or shore section being about four fifths of the length of the entire apron. This is hung from a gallows or supporting frame by means of a series of eye-bars sufficiently strong to hold the combined weight of the bridge and the load of locomotive and cars. These eye-bars at their upper ends consist of large screws, with what is known as gear wheels for nuts; these gear wheel nuts engage with worms on a transverse shaft, which shaft is turned by a series of belts and pulleys, the power used being a small steam engine. The outer one fifth of the above described bridge is hinged to the inshore four fifths, and is partially supported on a pontoon, and is hung to the before mentioned gallows frame with chains and also partially counter-weighted; it is raised and lowered to suit boats by means of windlasses worked by hand in a like manner to the heaving-in device on the passenger aprons; this requires a man on either side of the apron. It therefore requires to operate these bridges one engineer and two additional men, at a cost of not less than from $9 to $10 per day. The time required to land a boat and prepare for unloading cars is about twenty minutes.

The three freight slips here in San Francisco built and operated by the Commissioners (two at Lombard Street and one at the foot of Second Street) are operated by means of hydraulic cylinders worked by city pressure. The water after being used either in raising or lowering the bridges is exhausted into a tank and used by the Belt Railroad locomotive, thus making the expense of handling these aprons simply the wear and tear on the machinery, as the hydraulic device is operated by either a switchman or one of the deck hands of the freight boats. The ends of our aprons rest on the boats, it forming one abutment and the shore the other, for a 75-foot bridge. The boat is landed and the bridge is placed for unloading cars in from three to four minutes.

A peculiar circumstance connected with the Lombard Street slips is the fact that when the water for the use of the locomotive was taken directly through the meter, the cost of the same was from $22 to $26 per month; now that it is made first to do duty in operating bridges, the bill rarely exceeds from $18 to $20 per month.

While on the subject of operating aprons by hydraulic devices, I desire to call your attention to the system in use at the ferry. The

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water used in the various rams and cylinders when raising and lowering the aprons is exhausted into tanks beneath the floor of the engine room; these tanks when filled, automatically start a pump operated by electricity, which raises the water from the lower tanks into the tanks on the tenth story of the tower, where it is stored for use in again operating the rams and cylinders; in other words, the water is used over and over again, the cost being the amount of electricity used in pumping and the waste of water by leakage or evaporation.

Some idea of the saving by the use of this device can be formed by the following comparisons: The 10-inch ram elevator used in Station D of the post office at the New Depot has but a 16-foot lift. The bill for the water used in this elevator for the month of August was $134.83, whereas the cost of electricity for pumping the water used for the same month in operating five main aprons and one upper deck landing, consisting of ten 12-inch rams, one 8-inch and one 15-inch, having about 12 feet travel, also ringing the signal bell, was but $7.10.

I am, with the consent of the Board, making the necessary arrangement for connecting the post office elevator with my pumping system, and when completed do not think the cost of operating will exceed $30 per month.

PRESERVATION OF TIMBER.

During my stay in the East, I endeavored to procure as much information on this subject as my limited time permitted. I visited the creosoting works of Eppinger & Russell, Long Island City, New York; the office of the Lehigh Valley Creosoting Company, and had a lengthy conversation with Superintendent H. Comer on the subject; visited also the New York Wood Vulcanizing Works, and I discussed the subject with Messrs. A. Feldpauche, Assistant Chief Engineer of Pennsylvania Railroad, and O. Chanute, C.E., Superintendent of Burnettizing Works at Chicago, both gentlemen being recognized authorities on this subject. Altogether, I succeeded in accumulating a great deal of information, which I will condense as much as possible for this report.

All processes for the preservation of timber against decay are based on the principle of extracting or destroying the sap, which contains albuminous, gummy, resinous, oily, and other substances. These substances will, under favorable conditions of temperature and moisture, ferment and promote the germination and growth of fungi, which finally destroy the fibrous portion of the wood.

The principal processes used in the East are the following:

1. *Kyanizing.*—This is one of the oldest processes in use, and consists of infusing the timber with bi-chloride of mercury, commonly called corrosive sublimate, which coagulates the fermentable constituents of the sap. Corrosive sublimate is considered the strongest antiseptic

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metallic salt, and is also a virulent poison; it is used for infusion of timber in the form of a solution in the proportion of one part of bichloride of mercury by weight to one hundred parts of water. As the solution attacks iron, the tanks and other appliances intended for its use, have to be made of wood, copper, or masonry coated with coal tar.

The wood under treatment is generally weighted down with stones in the open tanks containing the solution, and allowed to pickle until properly saturated; the time required for this purpose being one day for each inch of thickness treated, plus one day; a piece of timber six inches thick thus requiring one week's time. In order to lessen this time timbers are steamed in closed retorts, exhausting the air and infusing the solution under pressure.

The life of timber preserved with this solution has been prolonged from two to three times over unpreserved timber of the same kind. Many objections have been raised against the use of this solution, on account of its being poisonous, but when properly handled no bad effects have been recorded.

There are works at Lowell, Mass., belonging to the Lock and Canal Company, which have been in existence since 1848, and which were at one time abandoned for a burnettizing plant which was used for twelve years, after which the company again took up kyanizing, as in their experience it was more satisfactory.

2. *Burnettizing.*—This process was patented in England in 1838 by Sir Joseph Burnett. The course of treatment originally applied consisted in soaking the timbers in a solution of chloride of zinc in open tanks, but was soon abandoned in favor of the much more expeditious and efficient mode of injecting the liquid under pressure by the vacuum system, patented the same year by Burnett for the injection of creosote. The manner of application is substantially as follows: The timbers are loaded on narrow-gauge cars, which are run into iron cylinders 80 to 100 feet in length, and 8 to 9 feet in diameter; after which the end doors of the cylinders are hermetically sealed and a portion of the inclosed air exhausted by a vacuum pump, when steam is injected to liquefy and evaporate the sap, which, with the help of further exhaustion by an air pump, is expelled from the wood by its own vapor and expanded air. The exhaustion is continued until the vacuum becomes constant on stoppage of the air pump, when the cylinder is filled with the antiseptic solution under a pressure of 100 pounds per square inch, which is gradually applied and maintained until it remains stationary on stoppage of the pressure pump. At the expiration of twelve hours, the average time required for the treatment, the doors are opened and the trains hauled out, leaving the cylinders in readiness for a new charge.

The solution used consists of two or three parts of chloride of zinc by

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weight to one hundred parts of water; the strength being regulated to suit the different kinds of wood, as well as the purpose for which they are intended. The timbers are somewhat hardened by the treatment and there is danger of rendering them brittle by increasing the proportion of zinc beyond normal requirements. The chloride of zinc must not contain any free acid.

All antiseptic metallic salts are easily soluble in water, and they are therefore apt to wash and leach out from rain and dampness. To overcome this objection, a process patented by Wellhouse, known as zinc tannin process, has given the best results. It consists in adding glue to the solution of chloride of zinc before impregnation. This solution is injected into the timber as above described; the surplus solution is then forced out of the cylinders, under air pressure, making room for a solution of tannin, which is admitted and maintained under pressure for a suitable length of time, when the surplus liquid is forced out of the cylinder, and this completing the treatment.

The additional solution of tannin forms with the glue in the chloride of zinc solution a hard, leather-like and water-proof substance, which effectually seals the outer pores of the wood so as to prevent the admission of dampness and thereby retaining the chloride of zinc in place.

There are three extensive burnettizing plants operated under the Wellhouse system in the East. They are all under the direction of O. Chanute, the gentleman before mentioned in this report.

3. *Vulcanizing.*—This process is entirely different from any other method of preserving timber, as nothing is injected into the same; it consists simply in heating the timber in closed cylinders with hot air under pressure to prevent the sap from evaporating. In green timbers, heat is applied to 112° F. to evaporate all the water that may be contained in the material. Heat and pressure are then applied, the former to from 400° to 500°; it is maintained under these conditions for six or eight hours, then the heat is shut off, but the pressure is maintained until the timbers are cooled off and taken out. During this process, the heated air is kept constantly circulating between the cylinder and heater. The dry heat, it is claimed, coagulates the albumen and, at the same time, changes the chemical nature of the sap into a preservative composition. Similar results are claimed when the process is reversed by substituting a vacuum for the pressure and a low temperature for heat. This process is very economical, as it does away with the cost of preserving chemicals and saving of time required to secure effective impregnation.

This process has been extensively employed by the Manhattan Elevated Road, seems to have given perfect satisfaction, and is therefore highly recommended by the officers of that road. The New York company has a large plant costing some $60,000, located on the Harlem River,

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bounded by One Hundred and Fifty-fifth and One Hundred and Fifty-sixth Streets and Eighth Avenue. I visited these works with Mr. A. Bevier, their local manager and vice-president. The samples and testimonials which he has are very convincing. The apparatus and machinery are the most complete and modern in use, and the company have undoubtedly the fullest confidence in their ability to increase not only the life of timber from fourteen to eighteen years, but also its strength and wearing qualities. The timber there used for preservation is rich in resinous matter, and it is a question in my mind what effect this process would have on our Oregon pine or Douglass fir.

CREOSOTING.

Without doubt the creosoting process is the most valuable and efficient of all processes known for prolonging the life of timber.

The process was invented in England about the same time that kyanizing and the other metallic salt antiseptics came into use; it has survived all other processes, and is used to a greater extent than any other method, both in Europe and this country.

The creosote is derived from the destructive distillation of wood and coal, and consists of oil products designated as dead oil when derived from the distillation of coal or coal tar, and wood creosote oil when derived from the distillation of wood or wood tar.

The dead oil contains naphthaline, phenic or carbolic acid, and other powerful antiseptics which change the chemical nature of the sap by forming therewith soluble compounds, while the napthaline, rendered sufficiently fluid by preliminary heating, enters the wood cells, solidifies, and becomes permanently fixed, mechanically coating and protecting the fibers against formation of fungi.

The wood creosote contains paraffine, pyroligneous acid, and other antiseptics. Advantages claimed for this oil are that its penetrating power is much greater and less expensive than dead oil, and that it is equally insoluble in water. The limited use of this oil seems to confirm these claimed advantages, but cannot be considered conclusive until more definitely established by further experience and the test of time.

The *modus operandi* for creosoting timber, and as employed by one of the largest works, the Eppinger & Russell Creosoting Works of Long Island City, New Jersey, is as follows: The timber is placed in a cylinder 100 feet long and 6 feet diameter, with a capacity of 15,000 feet board measure. It is then heated to a temperature of 250° by means of live steam passed into the cylinder. This heat is kept up to that temperature by means of a coil in the bottom of the cylinder, through which superheated steam is passed; this coil, before entering the cylinder, passes through a furnace or superheater, where it is heated up to 600° F. All sap is then exhausted by means of a larger vacuum pump, the heat

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in the cylinder being kept up until the by-pass shows that there are no by-products passing through the vacuum. This takes in the neighborhood of two hours; the creosote oil is then admitted. This oil has been kept in a supply tank heated to a temperature of 130° F., and is kept constantly agitated by passing the same from the tank to the pump by means of pipes connecting the same and having inverted nozzles. This is for the purpose of thoroughly mixing the oil and not allowing a settling of the heavier portions. The oil is then passed into the cylinder, and runs into the same by reason of the vacuum; it fills to two fifths of its capacity. It is then pumped from the tank into the cylinder until the latter is filled to its fullest extent, allowing it to overflow from the same until it shows quite a stream of oil running back into the supply tank. The pressure is then kept up from 70 to 160 pounds to the square inch; this is according to the density of the timber. The time sufficient to determine the amount of oil to the cubic foot depends upon the density of the wood, and can only be arrived at through practice. In the supply tank great care is taken to avoid the presence of water in the oil. This is done by means of an observation glass in the side of the supply tank, having located adjacent to it a pet cock for drawing off the water.

Mr. George S. Valentine is the general manager and superintendent of these works. He has undoubtedly had more practical experience in the erection and construction of creosoting plants than any one in the United States, and I am indebted to him for many valuable hints and information.

All preservation of timber in the East is mainly confined to the preservation of railroad and bridge timbers. The northern harbors which I visited are troubled but slightly with the limnoria and teredo. In wharf construction, it is employed only in preserving the underlying and exposed planking of wharves, or in suspended sewer work.

All experts on the preservation of timber agree on one point, and that is that the density of timber must be favorable to impregnation; in other words, only open-pored timbers should be used for treatment with creosote, this having the least liquidity and therefore the hardest of all preservative chemicals to force into and thoroughly impregnate the wood.

Our Oregon pine, or yellow fir, is considered by Mr. Valentine too dense to permit a thorough impregnation, and if treated with creosote requires a longer steaming and a greater heat to extract the sap and open the pores, and also a greater pressure to force the material into the wood. The consequences therefrom have been checking and cracking of the timber, making it brittle, and when used for piles has checked them so extensively that the limnoria has found in and behind these cracks sheltered places in which it has done its destructive work under cover and more rapidly than when exposed to swell and current. It has also

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made examinations of such piles more difficult, as the outer shell of the piles was apparently unattacked, while the inner portion of the same was entered and destroyed by the limnoria.

To impregnate timbers or piles with creosote sufficient to protect them against the attacks of the teredo, experience has taught that not less than 14 pounds to the cubic foot of timber should be injected.

The Curtis & Isaacs method in use here, which is an improvement on the Bolton process, overcomes the objection to the cracking and checking of the timber, inasmuch as the timber, in place of being artificially seasoned by means of heat and steam, is first boiled in the creosote oil, and while driving out the sap and moisture fills the space occupied by them with the dead oil. While there has been no extensive time test of this process, it is undoubtedly a fact that piles prepared by their method show no indications of checking and cracking. Mr. John D. Isaacs, one of the patentees, is very sanguine of its success, and he is the recognized authority on wood preservation on this coast.

All authorities in writing on the preservation of piles for marine work seem to ignore the existence of the *Limnoria terebrans*. In my opinion, it is much more destructive on this coast than is the teredo, and while a pile that has been thoroughly creosoted will resist the teredo, even if somewhat checked, the limnoria will find the slightest opening and destroy the pile. If our native redwood were obtainable in requisite length and diameter, I am satisfied it would be a much better timber for creosoting purposes than is the Douglass fir, as it is open pored and very susceptible to absorption.

The question having arisen as to the proper process for the preservation of the superstructure of the various wharves. I have taken the position that, while creosote is undoubtedly the best known preservative against dry rot, it is dangerous, for the reason that it increases the inflammability of the timber. While most of the local and some of the Eastern authorities disagree with me in this respect, I have satisfied myself by many practical experiments that my position is tenable; and while the fact that the Eastern building pine is rich in resinous matter and any addition of creosote affects its inflammability but slightly, the Douglas fir or Oregon pine, being dense in fiber and but slightly resinous, is rendered more inflammable by the addition of the creosote. I think it better, and have, therefore, recommended, that the superstructures be burnettized rather than creosoted, it having the additional merit of being a much cheaper process.

There have been several methods for the preservation of piles here in San Francisco by means of an exterior covering or artificial bark, some of which have been more or less successful; the success depending upon the durability of the covering, or, in other words, the life of the piles is the life of said artificial bark. The one making the best showing,

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from the fact that it has been the longest in use, is what is known as the Paraffine Paint Company's method. It consists of a covering of P. & B. pile covering covered with battens which have been treated with P. & B. paint. I think the secret of the success of this process is the fact that it is applied cold. Previous coverings of this character having been applied hot to a wet pile, no adhesion was obtained between covering and the pile, for the reason that the hot material draws the moisture to the surface.

This difficulty claims to have been avoided by the parties using what is known as the Perfection Process, by kiln-drying the piles before covering. Said process consists in covering the piles spirally with a double thickness of burlap treated with asphalt, the application or winding of the burlap being done by means of a large lathe in which the piles are turned. This covering has not had sufficient time test to pass on its merit, although it looks substantial.

Another protection against these marine pests is what is known as the built pile; it consists of a pile built up from a core of 6 x 6 with 1-inch boards until the same forms a pile 12 inches square, each layer being tarred and sanded. It is built on the theory that the teredo is loath to cross a seam, and the test pile taken from Section 1 of the seawall, a particularly favorite feeding ground of the teredo, after ten years' immersion, verified this theory. But this was a case of again ignoring the ever active limnoria, and piles built since have shown that the limnoria found a home in the seams of the boards of which the pile was constructed.

However, an improvement was made in the details of construction, at my suggestion, which has resulted in keeping the limnoria out, and that was the placing of ship felt between the last two layers of boards from high water to 2 feet below low water (limnoria working only between high and low water). The result has been quite satisfactory, although I think that a time test of a large quantity of piles is the only satisfactory one.

SEAWALL AND HARBOR EMBANKMENT.

The bulkheads or river walls, as built in New York and Boston and contemplated in Philadelphia, are constructed on the same general principles as are Sections "8A" and "8B" of the seawall here in San Francisco (and which are used as the foundation of the front wall of the new Union Depot and Ferry Building), but they differ somewhat in detail of construction, varying according to location and requirements.

The main or sea front of the New York bulkhead or river wall consists generally of a retaining wall of concrete, built up of blocks of this material of varying sizes as the conditions may require; the ordinary size being 12 feet long, 15 feet high, with a width of 7 feet at the base and 5 feet at the top, the battering side being placed to the waterfront.

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These blocks, where there is a rock bottom obtainable within a reasonable depth, rest on a foundation built up of bags of concrete laid in concrete on the rock bottom. Where a solid bottom is not accessible, a foundation of piles is used; these piles are sawed off about 15 feet below the line of low water by means of a circular saw hung to the gins of a pile-driving scow, and any inequality in sawing, caused by what is known as ground swell, is equalized by mattresses of burlap having a filling of concrete (the invention of Mr. Greene, the Chief Engineer) placed between the heads of the piles and the concrete blocks, the said blocks being placed when the mattresses are partially set.

Where the piles for the foundation require to be exceptionally long, brace or batter piles are used in addition to upright or standard piles. On the outer or sea front of these concrete blocks there is left a bench 4 feet wide and 2 feet deep; distant about 2 feet below low water from this bench to a distance of 4 feet above high water, the blocks are faced with dimension blocks of cut granite laid in cement mortar in headers and stretchers. These blocks are about 6 feet long, ranging from 2 to 4 feet in width and 2 feet in thickness.

Coping of the sea front consists of a backing log of timber on the waterfront line. The outer and inner faces of this wall are protected by a sloping wall of rip-rap. After the construction of this retaining wall, the street behind is filled with ashes or earth and allowed to settle, when it is finally paved.

The cement blocks are built in moulds at the several corporation yards of the commission, and are loaded onto barges, floated to the site of the work, and are lowered into place by the large floating derrick belonging to the commission.

All of the submarine work, such as placing the mattresses and bags of concrete, and staying and bracing the piles, is done by divers in the employ of the Harbor Commissioners.

The river wall in Boston harbor is built on the same plan as the retaining wall for the pier on the South Boston flats, described in this report under the head of "Boston Wharves."

There is contemplated in Philadelphia the construction of a bulkhead (to be built under the direction of the Department of Public Works) on the easterly line of Delaware Avenue, between Vine and South Streets. The plans and specifications have been prepared by the City Engineer. The details of construction are as follows: A trench is first dredged in the soft mud of the riverbed to a depth of about 30 feet below low water or as may be directed by the City Engineer. It is 20 feet wide on the bottom, with a slope of 2 to 1 on each side; the outer edge of this trench at its bottom being on the waterfront line. In this trench so formed and on the waterfront line are driven four rows of piles, 3 feet from centers transversely and 4 feet longitudinally. They are sawed off 10

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feet below mean low water, and the trench is filled to the height of the top of these piles with gravel, forming an embankment 16 feet wide on the top, having a slope of 1½ to 1 on either side. A mattress of concrete is then placed (of sufficient length to cover the area of the bottom block) on the heads of these piles (it is of similar construction to those used in New York) to receive the concrete blocks. These blocks are laid in three tiers, the lower being 12 feet long at the base and 10 feet at the top, 8 feet wide and 5 feet 6 inches thick; the battering side being placed in-board. The second block is 9 feet long at the base and 7 feet at the top, with a width of 8 feet and a height of 6 feet 6 inches, the battering side being also placed in-shore. The upper block or section (which is built in place) is 6 feet wide at the base, 3 feet wide at the top, and 10 feet high, and is made in continuous lengths of 72 feet where an expansion joint is allowed. This portion of the wall has a batter on its water or outward face of 1 inch to the foot; it has a bench on its inner face to receive curb. The outside is plastered on the sea-board side with what is there called granolithic mixture, leaving a smooth and finished surface. As an anchorage for this retaining wall, three rows of piles are driven just back of its inner line; they are placed 10 feet apart transversely and 8 feet longitudinally. The heads of these piles extend to a line half way between high and low water. They are clamped together near their tops transversely with double girder planks of 6 x 12, securely bolted to each pile. There are also three rows of longitudinal waleing pieces on these piles; the two outer lines consist of an 8 x 12 timber and the middle one being 14 x 18 timber. From this middle waleing at each bent a brace pile is driven (at an angle of 30° with the vertical) to the hard bottom; it is well secured to the waleing piece and adjacent standard pile. There is also an additional brace of 12 x 18 timber, which extends from the outer waleing to the bench of the lower block in the retaining wall. This retaining wall is anchored to the above described system of piling with a 2-inch wrought iron rod (at each bent or every 8 feet), fastened at one end to the central waleing and at the other end to a rod embedded in the lower concrete block. The piles used in this construction are specified to be either White Norway or Southern Yellow pine, and all sawed timbers to be long leaf Southern Yellow pine. The outer or seaward side of the slope of the embankment under wall is protected by a layer of rip-rap of large rock 4 feet in thickness on a slope of 1½ to 1.

After completion of the retaining wall, the space back of and inclosed by the same is filled with sand or other suitable filling to the official grade, and the surface of the street thus formed is paved with granite blocks. Along the front of this wall, and marking the waterfront line, a curb of 10 x 12 white oak is fastened to the concrete with anchor bolts.

As before mentioned in this report, the principles used in construction

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of Sections "8A" and "8B" of the seawall here in San Francisco are the same as those involving the construction of harbor embankments in New York, Boston, and Philadelphia, differing only in detail. But as these sections were built before any of the present members of the board held office, I will briefly describe the method of construction for the purpose of comparison.

Sections "8A" and "8B" of the seawall consist of a continuous retaining wall of concrete 842 feet long, 12 feet wide on the bottom, 6 feet on the top, and 18 feet high, the front or water side having a batter of 1 foot in the 18 feet, the back of the wall being a series of benches or steps.

This wall rests on a foundation of grillage consisting of a platform 14 feet wide supported on piles driven 4 feet from centers longitudinally and transversely; the mode of construction being as follows: A trench was first dredged along the site of the proposed wall 30 feet wide at the bottom and 25 feet below extreme low water, the sides of the trench being allowed to take their natural slope. In this trench so dug the platform piles were driven on the proper lines. These piles were 80 feet in length, and were driven by means of a follower to within one foot of the cut off, which is 22 feet below city base, or 9 feet below extreme low water. From this point the method of construction differs in detail from the Eastern. The platform piles were cut off with a circular saw driven by an engine; the saw being hung to a movable swinging frame mounted on an immovable false work of piles and timbers. As this framework was set absolutely level and the shaft of the saw vertical, it was possible and in fact imperative that the surface of the piles when sawed were perfectly level with each other, otherwise when the saw swung the second time over a pile that had been already cut (this being necessary in moving) it would make a second cut unless level; the accuracy was also tested with a leveling instrument. The advantage of this over the Eastern method of sawing these foundation piles is that it obviates the necessity of a mattress or cushion to equalize the bearing of the grillage. The platform resting on these foundation piles consists of first a solid platform of 14 x 14 timbers laid closely and bolted together transversely every 3 feet, the timbers being laid longitudinally with the platform. This platform so built is covered with 8 x 12 timbers laid transversely. They are spiked to the platform with wrought spikes, the seams being run and caulked. The platform thus built forms the bottom of a water-tight caisson with detachable sides. The caisson when constructed is floated into position over the platform piles. The necessary forms or moulds were erected and the filling-in of concrete commenced; the same settling into position when the caisson is about two-thirds filled. After the concrete has been allowed to set for about two weeks, the sides are detached and used on a

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second bottom or platform. The caissons used in the construction of these sections were about 150 feet in length, and the ends of the sub-sections of these were connected by means of coffer-dams, after construction. As the bottom of the bay in the locality where these sections were built is an unknown quantity, the sand filling behind this wall is supported on an independent platform of timber and plank at the line of low water; this platform rests on a foundation of piles driven 6 feet from centers longitudinally and 8 feet transversely. In other words, the concrete wall merely acts as a retaining wall for a bank of sand 12 feet high.

Each pile is loaded to the extent of ten tons, depending only on the suction or skin friction for its support, as borings in this locality to a depth of 200 feet showed the same character of mud as at the surface, differing only in density. However, I have made several tests in this locality, and a pile 90 feet in length was loaded with forty-five tons for a period of forty-eight hours without the slightest perceptible settlement. After completion, the trench and the area behind the retaining wall with its pile platform, are filled to the official grade or city base. The foundation piles are covered with sand to protect them from the teredo and limnoria, and the portion of the retaining wall exposed to the action of the waves is protected by a wall of rip-rap.

The above described is a special wall designed more for a foundation for the Ferry Depot, and is not the regular harbor embankment.

The seawall and thoroughfare, of which there has been constructed some 9,600 feet, is as follows: It consists of, first, a wall of loose broken stone 100 feet wide at a point 20 feet below low tide, sloping upward from that point on the natural slope assumed under water until it reaches city base on the inner side and to low-water mark on the outer or water side, this fixed point of 20 feet below low water being where the outer line of the waterfront intersects the slope of the embankment. From low-water mark on the outside, a layer of large rock 4 feet in thickness is hand-laid on a slope of 4 to 1 shorewards. This slope continues inshore for 36 feet, ending at a point 54 feet from the waterfront line. At this point a dry wall is built of large broken rock about 8 feet at the bottom and 5 feet in height, battering slightly in-board. Before filling in this above described embankment of loose rock, a trench is dredged along the line of same in the soft mud to a depth varying from 20 to 35 feet at low water (according to the density and character of mud). It has a width of from 20 to 30 feet on the bottom to receive the toe of slope. The rock used on the outer slope of the above described loose rock embankment, below the line of low water for a thickness of 10 feet, are specified to be in weight of not less than 400 pounds each. The wall thus described is protected on its outer side by a wharf 60 feet in width, built in the usual manner, with piles 10 feet from centers

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each way; the outer line of this wharf is on the waterfront line. The portion of the street and thoroughfare behind the embankment above described (said street being 200 feet in width) is filled to the official grade or city base with sand and broken rock, or dry earth, or any suitable material except mud. The surface, when sufficiently settled, is either macadamized or paved.

This construction of seawall is much better adapted to the conditions and requirements of this harbor than is that of Sections "8A" and "8B" or the Eastern construction, for several reasons:

First—It is much less expensive; costing on an average only $130 per lineal foot, while the average cost of Sections "8A" and "8B" was $240 per lineal foot (this is the full width of 200 feet).

Second—The foundation or bottom being an unknown quantity, any wall of masonry or concrete would be subject to fracture or destruction by reason of settlement, while in the case of loose rock embankment any settlement that occurs can be brought to grade by additional filling.

Third—In the use of the solid retaining wall, it is not possible to use the front of the wall for landing places, as the depth of the water along the line of same would not permit, there being a depth of only from 2 to 12 feet at low water; while along the front line of the wharf protecting the embankment there is 20 feet at extreme low water.

The most objectionable feature of this above described embankment has been the perishable nature of the protecting wharf piles; they have been destroyed in from one to three years by the teredo and limnoria, but this has been obviated somewhat by the renewal in all cases of repair with creosoted piles, and in any future seawall, cylinder piers of concrete can be used.

BELT RAILROAD.

In New York the freight landed in cars or loaded into same (either at Brooklyn, Jersey City, or New York proper) is mostly handled between these cities by means of car floats or barges having from two to three railroad tracks and capable of containing from twelve to eighteen cars. These are towed between these points or alongside of ship or steamer, where the cars are hauled ashore by the use of ferry slip and apron, or they are unloaded from the car onto the wharf or into the ship. There is, however, no continuous line of belt railroad in any of these cities. The freight department of the New York Central uses a short section of the track belonging to the street railroad belt line, and cars are switched, one and two at a time, by means of a small boxed-in, geared locomotive, which is greatly objected to by the merchants in the vicinity. What is lacking in length and connections of tracks, however, is made up by the use of numerous ferry slips and aprons, and at Martin's stores or warehouses on the Brooklyn side I saw five of these slips side by side, the tracks from them running (at right angles to the

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waterfront) either directly into the warehouse or alongside of same. The cars are handled by small boxed-in locomotives and sometimes by horses. The freight cars of all railroad lines having New York termini (except some portions of the New York Central) are handled in this manner.

In Boston there is a belt railroad 2½ miles in length, of double track, owned by the Union Freight Railroad Company, which extends along the waterfront and has switches into some of the wharves and piers. They handle the cars from the various railroad companies, either switching them onto the aforesaid wharves and piers, into the yard for unloading purposes, or transferring them from the southern to the northern railroads. They have in use three 31-ton boxed-in locomotives, and most of the switching is done at night, some being done in the day time with horses. The amount of freight handled or switched by this company during 1896, according to the report of the Railroad Commissioners, was about 370,000 tons. I investigated the character and extent of the business done by this company, which is as follows:

Switch No. 1—Into gas works, for coal, lime, and oil, 20 cars per week.
Switch No. 2—Into State Wharf, for a distillery company, handles molasses and spirits. (Not used at present.)
Switch No. 3—Warehouse for wholesale plumbers' supplies, 20 cars per week.
Switch No. 4—Warehouse, etc., for Fitchburg Railroad, general merchandise, 30 to 40 cars per day.
Switch No. 5—General merchandise for Southern trade, 10 to 15 cars per day.
Switch No. 6—Bonded warehouse for general merchandise, 15 cars per week.
Switch No. 7—Cold storage, also salt, grain, feed, and prepared plaster, 40 cars per week.
Switch No. 8—Supply stores, general merchandise, 15 cars per week.
Switch No. 9—Steamship Company's general merchandise warehouse.
Switch No. 10—Clyde Steamship Company's for Charleston, Jacksonville, Yarmouth, etc. Both these have 50 cars per week.
Switch No. 11, 12—Warehouse for general merchandise, also fish, etc., 25 cars per week.
Switch No. 13—Freight yard, for the general delivery of bulk goods, mostly produce, ice; contains cold-storage warehouse, capacity of 30 cars; handle about 8,000 cars per annum.
Switch No. 14—Clinton Market, handle 20 cars fresh beef daily.

South and north of these points there is nothing but connections with northern roads; the connections at south, when terminal depot is finished, will be changed to around same and along Dorchester Avenue. The charges on this road for switching are 20 cents per ton, with a minimum of 30,000 pounds, or not less than $3 per car; the companies for whom the switching is done having to place all cars on the sidings ready for switching. Transfers from southern to northern roads are $4 per car or 40 cents per ton.

On the Cambridge and Charleston side all freight is handled by teams, and I am informed 90 per cent of all freight landed in Boston is hauled to the consumer by team. On three of the principal wharves in Boston the record is as follows: There were 400,000 tons of freight landed in five

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years. Of this, 20,000 tons were handled with lighters, 14,000 stored in warehouses, 100,000 loaded into cars, and 266,000 hauled by team. The belt railroad of Boston is used more as a transfer track from the northern to the southern roads than it is to bring ship and car together. Most of the piers where this is extensively done are owned by the railroad company using them, as is generally the steamship line.

The Philadelphia Belt-Line Railroad, as contemplated, will be 16½ miles long. It will be built under an ordinance granted by the Select and Common Councils of the City of Philadelphia to the Philadelphia Belt-Line Railroad Company. It will follow the general line of the Schuylkill and Delaware rivers along the waterfront, and will have spurs and branches to the various wharves along the waterfront and into warehouses and manufactories along the line, so that the owners of these wharves and warehouses will have the full benefit of receiving and delivering their freight.

The company is required by the terms of the ordinance to furnish indemnification bonds, guaranteed by one or more of the Philadelphia trust companies, to the gross amount of $525,000, that the city shall be protected from any damage, loss, or claim by reason of the construction of the railroad tracks. The switching charges are also limited by the General Assembly act regulating all railroad companies. Sections 9 and 13 of this ordinance are as follows:

SECTION 9. That the dividends on the fully paid stock be limited to six per cent per annum, all excess of earnings to go to the City of Philadelphia.

SECTION 13. That, before exercising any of the rights or privileges herein or hereby granted, the Philadelphia Belt-Line Railroad Company, the officers, directors, and all the shareholders thereof, shall execute, to the satisfaction of the Mayor and City Solicitor, an agreement providing for the creation of a voting trust for all the stock of the said railroad company. Also, an agreement providing for a gift of fifty-one (51) per cent of the present stock of said railroad company and fifty-one (51) per cent of all the stock which may hereafter be issued by it to such corporations and persons as may be legally competent to act thereunder, to the end that the said railroad may forever be maintained for the common use of all railroads upon equal terms, without discrimination.

No continuous portion of the road has been constructed as yet, but its main object is undoubtedly to insure a terminus for all railroads, present and future. The charges for switching on this road are from $2.50 to $4 per car.

The Belt Railroad here in San Francisco consists of a main line of double three-rail track (standard and narrow gauge), about one mile in length, extending along the thoroughfare from Vallejo to Powell streets; it has switches into the yards of the North Pacific Coast Railroad, the San Francisco & North Pacific, and Southern Pacific Company, and also to the two freight slips near the foot of Lombard Street. This is all the property of the Board, together with the freight sheds and land occupied by the same. The rolling stock consists of one standard gauge

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saddle-back Baldwin switch engine (50 tons), one flat and one hand car. The rate for switching received by the State is 75 cents per car, which switching consists in hauling a loaded freight car from the ferry-boat, placing it in the proper yard, and returning when desired to the boat, or vice versa. (The charges in Boston for this service are from $3 to $4 per car.)

In the seven years that this road has been in existence there have been switched 98,902 cars, for which there has been received, at 75 cents per car, $74,176.50.

The amount of salaries paid to employés of the road during that period was $59,614.86. Added to this should be the cost of maintenance, which is $27,211.23, making a total of $86,826.09, or an excess in cost of operating over receipts of $12,649.59.

If we add to this the interest, at the low rate of 4 per cent per annum for seven years (on the cost of construction, $90,661.26), we would have an additional loss of $25,385.15, making a total loss in seven years of $38,034.74. If we add this interest of $25,385.15 to the cost of operating the road for seven years ($86,826.09), it makes a total of $112,281.24, and if we divide this total by the number of cars switched in that time (98,902), the cost of switching per car would be about $1.13, against 75 cents (the amount received), and yet there are some of our San Francisco merchants who claim that the Belt Railroad is the source of an immense revenue to the State.

It has been urged by some of these same merchants that this Belt Railroad should be extended at once from its southerly terminus to join the tracks of the Southern Pacific Company at Second and Townsend streets, as this would, they claim, bring ship and car together and relieve them from the so-claimed excessive drayage. I do not wholly agree with our mercantile friends, for several reasons:

First—There has been in existence for the past seven years (the life of the Belt Railroad) a track on the wharf just south of Lombard Street wharf which gives the ship and car direct connection (this much cherished desire of the mercantile community). In these seven years that track has been used but four times, and then by the San Francisco & North Pacific Railroad for coal to be used on their local road.

Second—With a connecting track along East Street from Vallejo to Second, it would not be possible to utilize that portion of the water-front between Folsom and Pacific streets, as there is no property in that locality belonging to the State which could be used for yard purposes, and private property is more valuable for other purposes, such as retail business, etc., aside from the fact that the passenger traffic to the ferries and the teaming in this vicinity are of such magnitude that the switching could be done for only a few hours in the night.

Third—The same result can be accomplished (and is partially so at

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the present time) in a like manner to that of New York, Boston, and Brooklyn. I mean by transfer boats utilizing the slips at Lombard and Second streets, making these boats the connecting link between the north and south ends. I do not mean the abandonment of a rail connection, but if such were built, I would suggest its use be only for a transfer track for an occasional car or cars between the north and south ends, making the transfer of large trains by water, as this mode is acknowledged to be the most economical when volumes are in question.

What is needed most on the Belt Railroad, in my opinion, is more extensive yard room. At the present time we are obliged to use the main track for car storage purposes, which is against all principles of good railroading. It has been suggested, in discussing the question of the proposed Free Market, that the Belt Railroad be elevated and connected with a double deck central wharf, located, say at Jackson or Washington streets, and extending along Drumm and Main streets, connecting with the Southern Pacific at Second, having turntables at the various warehouses and stores along the line, with an appropriate bridge spanning Market Street. Such a suggestion could have only emanated from a would-be rival of the late lamented Edward Bellamy.

PAVEMENT OF ROADWAYS AND APPROACHES TO WHARVES.

In Boston, where the superstructures of the many bridges are of wood, it is the custom to pave the roadways of the same with granite paving-blocks.

The underlying planks are first prepared with creosote or some preservative against dry rot, and are then covered with four layers of roofing felt laid and fastened together with roofing pitch, composed of distilled coal tar or asphaltum. On this covering of felt is then laid an asphaltic concrete three quarters of an inch in thickness, then a bed of dry sand two inches thick, into which the paving-stones are laid and rammed; the joints being filled partially with beach gravel and then grouted with hot paving-pitch or asphalt. This method of paving would be excellent for such portions of the waterfront piled streets, as say Steuart, Bryant, Beale, and Brannan, where the excessive travel is such that the life of the piles and superstructure far exceeds that of the covering plank.

The following is a letter from Mr. O. Chanute, with whom I had quite a lengthy interview with regard to wooden pavements and the preservation of timber for the same:

CHICAGO, ILL., September 30, 1897.

HOWARD C. HOLMES, ESQ., *Chief Engineer, Harbor Commissioners, San Francisco, Cal.:*

DEAR SIR: In answer to your verbal inquiry as to the applicability of burnettizing to paving-blocks, I beg to say that the blocks originally laid on the wagon floor of the St. Louis bridge were of "sweet gum" wood, which generally decays in one or two years. They were burnettized by the zinc-tannin process, and when they were taken

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up after seven years' exposure, during which they were watered every day, they were almost entirely sound, although they were worn down by the traffic to half of their original depth.

Paving-blocks of various woods, prepared by the same process, and laid in some busy streets in St. Louis, gave practically the same results.

In neither case were these pavements renewed with burnettized wood because they gave out from wear and not from decay within the natural life of the more durable woods, unprepared.

I believe that creosoting would exhibit still more favorable results, because the oil would resist better the intrusion of moisture, but it would be much more costly.

Whether it is advisable to prepare wooden blocks for any street will depend upon its traffic. If the latter wears out the blocks in five to seven years, they had better be laid in the natural state. If the traffic will only wear the block out in eight to ten years, then it would seem preferable to prepare them artificially to resist decay.

Respectfully,

O. CHANUTE.

Our native redwood, while it is undoubtedly one of the best known woods to resist rot of any kind, is, in my opinion, of too soft and porous a nature for paving purposes and is more apt to wear out than rot. The roadway of Folsom Street Wharf No. 1, Pier 12, has been paved with redwood blocks, and the approach to this will be an excellent place for testing the efficiency of this timber for paving purposes.

The Oregon pine or Douglass fir, while its lasting qualities as regards dry rot will not compare with redwood, is of such a tough fiber and so close grained that, if preserved against rot, it would, in my opinion, make the ideal pavement for a roadway of wharves or approaches thereto.

There is a section of pavement of unpreserved Oregon pine blocks on East Street, between Market and Mission Streets, laid some three years ago, and of which no care has been taken, which still makes a very creditable showing; this locality is one of the most traveled streets of San Francisco for heavy traffic, there being about four hundred teams an hour going and coming. There were laid previously, on the same foundation, within one year, two coverings of bituminous rock, which failed to withstand the wear.

I have on file in my office, bearing the certificate of the City Engineer of Galveston, Texas (Mr. H. S. Wilson), a yellow pine paving block which was laid on Market Street of that city in June, 1874, and was taken up in April, 1892, being in constant use for eighteen years, and although it is slightly worn, it does not show the slightest indication of decay.

These blocks were treated with creosote by Mr. George S. Valentine with 12 pounds of oil to the cubic foot.

In conclusion, I will say that the waterfront of this city, especially that portion from Folsom Street north, is in excellent condition (all repairs in the past few years having been made with prepared piles), and that it will compare very favorably in detail of construction and condition with any of the Eastern cities before mentioned.

It was rumored some time ago that the much abused concrete founda-

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tion of the New Depot was a failure, inasmuch as it had settled in places to the extent of from one foot to eighteen inches. Instrumental surveys were made by disinterested engineers in the employ of public benefactors, with the result that one corner of the foundation, which is 690 feet long and 155 feet wide, varied from the other three corners just three eighths of an inch. I am still of the opinion that the policy of the Board as to the seawall, should there be any further extensions made, that it should be on the southerly end, for reasons mentioned in my last report.

Plans have been adopted for the termini of the various street railways in front of the Ferry Depot. The various stands of the different lines (sixteen in number) have been so arranged as to give each one prominence and easy access for passengers, leaving broad and unobstructed passageways for foot passengers to both sides of Market Street.

Respectfully submitted.

HOWARD C. HOLMES,
Chief Engineer.

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EXHIBIT U.

REPORT OF ATTORNEY FOR THE BOARD.

SAN FRANCISCO, September 8, 1898.

To the Honorable the Board of State Harbor Commissioners of the State of California:

GENTLEMEN: The undersigned, the Attorney of your Honorable Board, begs leave to submit the following report respecting the affairs of his department:

Reference is made to the Biennial Report of the Board of State Harbor Commissioners for the year 1896 for the last report of your Attorney, the same being found at pages 41 to 44, inclusive, of said Biennial Report.

Since the date of your Attorney's last report, the Board has been involved in considerable litigation affecting the letting of contracts and the purchase of supplies. The opinion of your Attorney respecting these matters, though sometimes at variance with that of other counsel, has been uniformly sustained by the courts whenever the matters referred to have been made the subject of judicial investigation.

The case of E. L. Colnon et al. vs. Pacific Improvement Co. et al., involving the right to the waterfront on the south side of Channel Street, between Fifth and Sixth Streets, in the City of San Francisco, and referred to at page 43 of the last Biennial Report, has been tried and judgment rendered by the Superior Court in favor of the Board. This case was of more than usual importance, because of the serious nature of the questions involved. Defendants have perfected an appeal to the Supreme Court, where the case is now pending.

It may not be inappropriate for your Attorney to here express his high appreciation of the uniform kindness and courtesy shown him by the several members of the Board during his term of office now drawing to a close.

Following is a detailed account of the present status of all litigation in which the Board is interested:

E. L. Colnon et al. vs. *Pacific Improvement Co. et al.*

Since my last report the lower court rendered judgment in this case, deciding every point at issue in favor of plaintiffs.

Defendants have perfected an appeal to the Supreme Court, where the action is now pending.

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Michael Klein vs. *E. L. Colnon et al.*

Action for damages for personal injuries. When my last report was made this action was pending in the Superior Court. On June 27, 1897, plaintiff dismissed the action, and in December, 1897, plaintiff commenced the present action, and the same is now pending in the Superior Court.

* * * * *

O. Erickson et al. vs. *E. L. Colnon et al.*

Action for damages for personal injuries. Since my last report a verdict and judgment were rendered in favor of defendants. A motion for a new trial is now pending in the Superior Court.

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Chas. F. Bassett et al. vs. *J. M. Wood et al.*

Since my last report defendant J. J. Rauer was granted a new trial, which is now pending.

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Ellen Dore et al. vs. *Harbor Commissioners et al.*

Action for partition. On September 28, 1897, the Court sustained a demurrer interposed by the Harbor Commissioners. The Board is no longer interested in the suit.

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Pacific Pine Lumber Co. vs. *Harbor Commissioners.*

Prohibition to restrain Board from drawing warrant in favor of S. E. Slade Lumber Company. On October 26, 1897, plaintiff dismissed the proceedings.

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Pacific Pine Lumber Co. vs. *Harbor Commissioners.*

Certiorari to review proceedings in regard to S. E. Slade Lumber Company's contract. Three distinct suits. Proceedings dismissed by plaintiff.

* * * *

People ex rel. Board of State Harbor Commissioners vs. *American Surety Company.*

Action to recover $485.57 on bond for damages on account of breach of contract between Board of State Harbor Commissioners and Galloway, Townley & Co. Suit compromised and dismissed.

* * * * *

William H. Healy vs. *Harbor Commissioners.*

Prohibition to enjoin Board from opening bids and awarding contract to cure piles. Proceedings dismissed by plaintiff.

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Samuel C. Irving vs. *Harbor Commissioners.*

Suit in equity to enjoin defendants from opening bids and awarding contract to cure piles. Judgment for plaintiff in Superior Court. Now pending on appeal to Supreme Court.

* * * * *

Paraffine Paint Co. vs. *Harbor Commissioners.*

Mandamus proceedings to compel awarding of contract for preservation of piles. Writ of mandate granted, and appeal taken to Supreme Court, where same is now pending.

* * * * *

Joseph Warren vs. *E. L. Colnon et al.*

To recover $25,000 damages for personal injuries. Action commenced September 1, 1898, and is not yet at issue.

* * * * *

Union Transportation Co. vs. *Charles F. Bassett et al.*

New trial granted, and case remanded to Superior Court, where same is now pending, with prospect of an early dismissal.

* * * * *

Martin vs. *Harbor Commissioners.*

Since my last report this action has been dismissed.

Respectfully submitted.

TIREY L. FORD,
Attorney for the Board.

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EXHIBIT V.

REPORT OF ARCHITECT.

SAN FRANCISCO, July 1, 1898.

To the Honorable the Board of State Harbor Commissioners, Union Depot and Ferry House, San Francisco, California:

GENTLEMEN: In submitting to you a report on the construction of the Union Depot and Ferry House, I desire to say that the building will be entirely completed and formally opened on July 11, 1898.

My appointment as Architect was made by your Board on February 26, 1896, at which time no actual work had been done on the superstructure, the foundation alone having been completed.

Contracts had been entered into on January 23, 1896, for the work embodied in the specifications, for masonry; carpenter, plastering, and glazing; roofing and galvanized iron; painting; and plumbing and gasfitting; and on March 20, 1896, for the constructional steel and cast iron work.

Owing to litigation in regard to what law governed the Board in the construction of the depot, unavoidable delay had been occasioned up to this time, but upon its settlement the steel and cast iron work was commenced and proceeded so rapidly that on May 1, 1896, a large quantity of that material had been set, continuous progress being made until it was finally completed on December 2, 1897, or nineteen months from the time of commencement.

I do not consider the length of time occupied in erection of the steel work excessive, when the enormous amount of material is considered, together with the difficulties encountered in the erection, it being performed over the heads and in the midst of the thousands of passengers traveling daily underneath. The whole was accomplished without the loss of a single life on the part of the traveling public, nor the slightest injury being inflicted, which I consider very creditable to the contractors engaged upon the work.

Another matter which should be mentioned is that, as originally contemplated, the building was to be erected in three sections, each one of which was to be nearly finished before the next was commenced; no attention, however, was paid to the sections, the whole structure being erected continuously, thereby saving much time, although involving more care for the safety of the public.

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During the erection of the steel work each of the other contractors had been making preparations to commence his work at the proper time.

The most important one of these was the masonry contract, and through which another delay occurred, for the following reason: The material originally specified to be used for the exterior of the building was Oregon gray sandstone, it being the cheapest stone offered under the bids of December 10, 1895, all other stone material being much higher.

In March, 1896, the contractor for masonry offered to supply Colusa stone, from Sites, Colusa County, in place of the Oregon gray, without any increase in price, although under the original bids Colusa stone would have cost $53,000 more had the Board desired to use it. The subject was taken up by your Board and investigation made as to the quality of the stone by sending experts to examine the quarry and to have analyses made to ascertain its component parts.

The experts reporting favorably as to the good qualities of the Colusa material, and that, in their opinion, it was harder and more durable than the stone specified, your Board therefore, on April 10, 1896, entered into a supplementary contract with the contractor for masonry, allowing the substitution to be made.

A suit was immediately commenced by the agents of the Oregon stone to enjoin the Commissioners from making the change, and six months elapsed before a decision was rendered by the courts, resulting favorably to your Board. During all this time no work could be done by the contractor, for the reason that he could not know how it would terminate; but upon the decision being rendered he commenced quarrying and cutting stone, delivering and setting the first shipment about November 1, 1896, and progressing continuously until completion, April 6, 1898, a period of about seventeen months, a not unreasonable time when the magnitude of the work and the difficulties under which it was conducted are considered.

During the progress of the work other important changes were made in the class of material used, at slightly increased expense, one of them being the substitution of the expanded metal and concrete arches for the terra cotta arches originally specified. This change was not made without an exhaustive examination being made of the qualities of the expanded metal and concrete combination, and in order to determine them two specimen arches were constructed at the building, in exactly the position they were to occupy finally, and it was found that the proposed form of construction answered all the purposes of weight-bearing qualities. To demonstrate this it will only be necessary to say that a test of one of the arches revealed the fact that it would support without deflection a uniformly distributed load of 744 pounds per square foot, the greatest load the arches being required to carry being 75 pounds per

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square foot. In other words, the strength of the arches was ten times greater than the work they were called upon to perform.

The object in making the change to the expanded metal arches and in eliminating the terra cotta was in order to obtain marble finish for the grand nave. This nave or central portion of the building on second story is 45 feet wide by the length of the building, 659 feet. The piers were originally to be constructed in enameled brick; the spaces between the same on the westerly side were in the same material, and on the easterly side between the piers there were wooden partitions. Your architect desiring to obtain marble wainscoting in place of the wood and enameled brick, submitted the conditions to the contractor for masonry, and he agreed to make the changes for a slight increase over his contract price, some few other items being taken into consideration at the same time.

This change to marble has resulted in a vastly improved appearance of the nave, the marble wainscoting, which is 12 feet 3 inches high around the entire walls, being a very attractive piece of work and commanding universal admiration.

Another change which was made was the omission of all partitions in mezzanine story. This part of the building was originally divided into twenty-three offices, and as the Commissioners saw no need of such a large number of rooms, there being no applications to rent any of them, they decided to omit them, together with all other finish of various kinds, suitable deductions being made by the contractors. This was chiefly the result of an application on the part of the State Board of Trade and the State Mining Bureau for quarters in the building which require no partitions. These quarters are now being fitted up and will soon contain the exhibits of the respective boards, forming a very attractive and instructive feature, also greatly admired. The Commissioners are of the opinion, and very justly so, that an exhibit of the products of the State of California, both mineral and agricultural, is fittingly installed in this magnificent building at the entrance to the bay.

Several other changes have been made from the original plans and were necessary by reason of changed conditions as to requirements of tenants. For instance, the space originally devoted to Post Office purposes has been vastly increased by enlargement in the first story, together with a large space in second story set apart for that purpose, enabling an immense amount of mail matter to be handled without loss of time, and making Station D the most important branch Post Office in the city.

All of the changes were made with only two objects in view, first, for the convenience of tenants, and second the improvement of the appearance and quality of the material used in the building.

Before concluding, an enumeration of some of the principal dimen-

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sions of this vast building, together with quantities of material used, may be interesting.

Its total length is 659 feet, and the general width 159 feet. From the central portion on the Market Street front a bay projects 28 feet, and 144 feet wide. The total height of the building from top of foundation to top of parapet wall is 54 feet. The size of the tower is 32 feet square, and the height from foundation to the time ball on top is 245 feet, the flagstaff ball being 30 feet higher, making 275 feet extreme height.

There were used in the construction of the building about 5,000,000 pounds of steel and cast iron; 2,000 cubic feet of granite; 30,000 square feet of marble; 53,000 cubic feet of sandstone; 1,450,000 common brick; and 125,700 square feet of expanded metal and concrete floor arches. There are also about 40,000 square feet of mosaic flooring, and 375,000 pounds of galvanized iron, including roofing.

There has been more or less unjust criticism from the public that this building has taken an unusual length of time in erection, but I think that when the facts are considered it will be found that it has been built as rapidly as the average San Francisco commercial building and more rapidly than any other public building in this city.

The date of the steel contract was March 20, 1896, which may be said to be the commencement of work, and the building was completed July 11, 1898, or about twenty-eight months. From this should be deducted six months' delay by reason of litigation connected with the stone question, and perhaps, on a low estimate, two months of rainy days, leaving twenty months as actual building time. Any ordinary sized building of this class, covering 10,000 square feet, takes a year or more to build. The Ferry covers about 107,000 square feet of surface, or more than ten times that of an ordinary building, and it certainly is no more than fair to suppose that it would take six or eight months longer in erection.

In closing I desire to say that at all times during the progress of the work I have always had in view the improvement of the building, so far as the funds at the disposal of the Commissioners would allow, and, in suggesting changes, have not desired, in any manner, to criticise the designs as shown on the original plans. Had the former architect lived to complete his work he undoubtedly would have suggested similar alterations to those I have made, and was probably only deterred from using some of the present constructional material on account of the cost, then thought to be too great.

I desire to return thanks to your Chief Engineer, Mr. Howard C. Holmes, for his courtesy and assistance throughout the progress of the work, and to yourselves, gentlemen, for the uniform consideration of which I have been the recipient at all times.

Yours respectfully,

EDWARD R. SWAIN,
Architect Union Depot and Ferry House.

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